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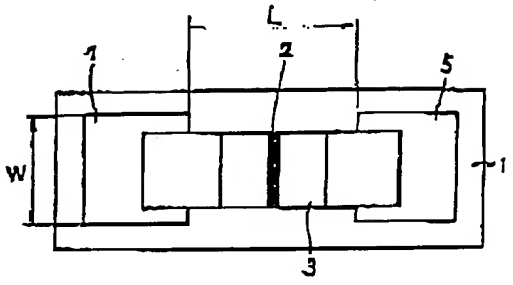
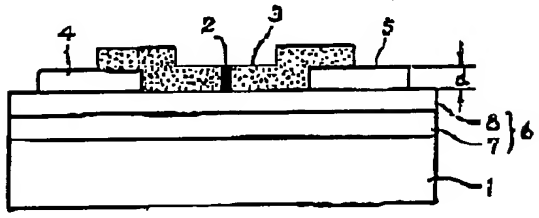
TITLE : ELECTRON EMITTING ELEMENT, ELECTRON SOURCE, IMAGE FORMING DEVICE USING THE SAME, AND THEIR MANUFACTURE





ABSTRACT : PROBLEM TO BE SOLVED: To reduce the influence on element component members and on electron emission characteristics by heat generation during current-carrying forming process so as to achieve high reliability of an electron emission element by forming an electron emitting part through a reverse piezoelectric effect on a conductive film.

SOLUTION: A piezoelectric element 6 consisting of a piezoelectric electrode 7 and a piezoelectric layer 8 is formed over a substrate 1, element electrodes 4, 5 are provided on the piezoelectric element 6, and a conductive film 3 is formed between the electrodes 4, 5. In current-passing forming, a current is passed between the electrodes 4, 5 and a voltage is applied to the piezoelectric electrode 7 to destroy, deform, or denature the conductive film 3 locally to form an electron emitting part 2. Deflection of the conductive film 3 caused by a reverse piezoelectric effect promotes the local destruction, deformation, or denaturing to reduce the amount of heat during the current-passing forming so as to reduce the influence of the heat on the component members of the element and on electron emission characteristics. Also, the power consumption and the processing time required for the formation of the electron emitting part can both be reduced greatly.

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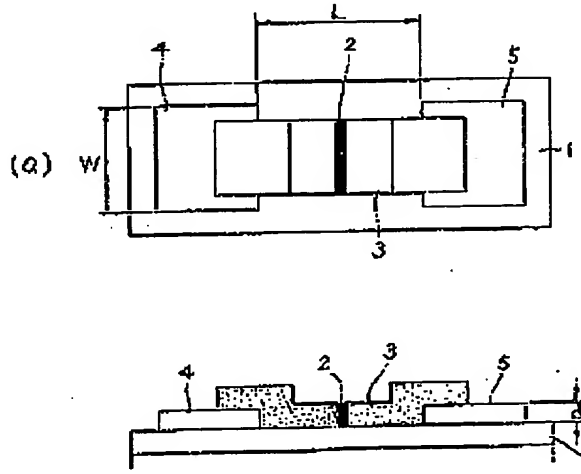
(54)【発明の名称】　電子放出素子、電子源、及びこれを用いた画像形成装置とそれらの製造方法

(57)【要約】

【目的】　フォーミング処理時の発熱による素子構成部材及び電子放出特性への影響を低減し得る表面伝導型電子放出素子の製造方法を提供する。

【構成】　導電性膜３の下部に圧電体６を付設し、導電性膜３への逆圧電効果により、導電性膜３に電子放出部２を形成する工程を有する電子放出素子の製造方法。



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【特許請求の範囲】

【請求項１】　電極間に、電子放出部を有する導電性膜を備える電子放出素子の製造方法において、
導電性膜への通電効果により、該導電性膜に電子放出部を形成する工程を有することを特徴とする電子放出素子の製造方法。

【請求項２】　更に、前記導電性膜への通電処理により該導電性膜に電子放出部を形成する工程を有することを特徴とする請求項１に記載の電子放出素子の製造方法。

【請求項３】　電極間に、電子放出部を有する導電性膜を備える電子放出素子の製造方法において、
導電性膜に付設された圧電体に電圧を印加する工程を有することを特徴とする電子放出素子の製造方法。

【請求項４】　更に、前記導電性膜に通電処理を行う工程を有することを特徴とする請求項３に記載の電子放出素子の製造方法。

【請求項５】　前記電子放出素子は、表面伝導型電子放出素子であることを特徴とする請求項１～４のいずれかに記載の電子放出素子の製造方法。

【請求項６】　請求項１～５のいずれかに記載の製造方法にて得られたことを特徴とする電子放出素子。

【請求項７】　電子放出素子と該電子放出素子の駆動手段とを有する電子源の製造方法において、
前記電子放出素子が、請求項１～５のいずれかに記載の方法にて製造されることを特徴とする電子源の製造方法。

【請求項８】　前記電子源は、複数の電子放出素子が並列に結線された素子列を少なくとも１列以上有する電子源である請求項７に記載の電子源の製造方法。

【請求項９】　前記電子源は、複数の電子放出素子が並列に結線された素子列の複数列がマトリクス配置されている電子源である請求項７に記載の電子源の製造方法。

【請求項１０】　請求項７～９のいずれかに記載の製造方法にて得られたことを特徴とする電子源。

【請求項１１】　電子放出素子と電子線の照射により画像を形成する画像形成部材とを有する画像形成用パネルの製造方法において、
前記電子放出素子が、請求項１～５のいずれかに記載の方法にて製造されることを特徴とする画像形成用パネルの製造方法。

【請求項１２】　前記画像形成用パネルは、複数の電子放出素子が並列に結線された素子列を少なくとも１列以

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製造方法。

【請求項１５】　請求項１１～１４のいずれかに記載の製造方法にて得られたことを特徴とする画像形成用パネル。

【請求項１６】　電子放出素子と、画像形成部材と、前記電子放出素子から放出される電子線の前記画像形成部材への照射を信号信号に応じて制御する駆動手段とを有する画像形成装置の製造方法において、
前記電子放出素子が、請求項１～５のいずれかに記載の方法にて製造されることを特徴とする画像形成装置の製造方法。

【請求項１７】　前記画像形成装置は、複数の電子放出素子が並列に結線された素子列を少なくとも１列以上有する画像形成装置である請求項１６に記載の画像形成装置の製造方法。

【請求項１８】　前記画像形成装置は、複数の電子放出素子が並列に結線された素子列の複数列がマトリクス配置されている画像形成装置である請求項１６に記載の画像形成装置の製造方法。

【請求項１９】　前記画像形成部材が、蛍光体である請求項１６～１８のいずれかに記載の画像形成装置の製造方法。

【請求項２０】　請求項１６～１９のいずれかに記載の製造方法にて得られたことを特徴とする画像形成装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、電子放出素子、該電子放出素子を多数個配置してなる電子源、及び該電子源を用いて構成した表示装置や露光装置等の画像形成装置に関する。

【０００２】

【従来の技術】従来、電子放出素子には大別して熱電子放出素子と冷陰極電子放出素子の２種類が知られている。冷陰極電子放出素子には電界放出型（以下、「ＦＥ型」と称す。）、金属／絶縁層／金属型（以下、「ＭＩＭ型」と称す。）や表面伝導型電子放出素子等が有る。

【０００３】ＦＥ型の例としては、W. P. Dyke and W. W. Dolan, "Field Emission", Advance in Electron Physics, 8, 89 (1956) あるいはC. A. Spindt, "Physical Properties of thin-film f

ものが知られている。

【０００５】表面伝導型電子放出素子の例としては、M. I. Elinson, Radio Eng. Electron Phys., 10, 1290 (1965) 等に開示されたものがある。

【０００６】表面伝導型電子放出素子は、絶縁性基板上に形成された小面積の薄膜に、膜面に平行に電流を流すことにより、電子放出が生ずる現象を利用するものである。この表面伝導型電子放出素子としては、前記エリンソン等によるSnO$_2$薄膜を用いたもの、Au薄膜によるもの[G. Dittmer: "Thin Solid Films", 9, 317 (1972)]、In$_2$O$_3$／SnO$_2$薄膜によるもの[M. Hartwell and C. G. Fonstad: "IEEE Trans. ED Conf.", 519 (1975)]、カーボン薄膜によるもの[荒木久 他：真空、第２６巻、第１号、２２頁（１９８３）]等が報告されている。

【０００７】表面伝導型電子放出素子は、絶縁性の基板上に形成された導電性膜に、膜面に平行に電流を流すことにより電子放出が生ずる現象を利用するものである。

【０００８】表面伝導型電子放出素子の典型的な構成例としては、絶縁性の基板上に設けた一対の素子電極間を連結する金属酸化物等の導電性膜に、予めフォーミングと称される通電処理により電子放出部を形成したものが挙げられる。フォーミングは、導電性膜の両端に直流電圧あるいは非常にゆっくりとした昇電圧、例えば１V／１分程度の昇電圧を印加通電することで通常行われ、導電性膜を局所的に破壊、変形もしくは変質させて構造を変化させ、電気的に高抵抗な状態の電子放出部を形成する処理である。電子放出は、上記電子放出部が形成された導電性膜に電圧を印加して電流を流すことにより、電子放出部に発生した亀裂付近から行われる。

【０００９】上記表面伝導型電子放出素子は、構造が単純で製造も容易であることから、大面積に亙って多数配列形成できる利点がある。そこで、この特徴を活かすための種々の応用が研究されている。例えば表示装置等の画像形成装置への利用が挙げられる。

【００１０】従来、多数の表面伝導型電子放出素子を配列形成した例としては、並列に表面伝導型電子放出素子を配列し、個々の表面伝導型電子放出素子の両端（両素子電極）を配線（共通配線とも呼ぶ）にて夫々結線した

せた表示装置が提案されている（アメリカ特許第５０６６８８３号明細書）。

【００１１】

【発明が解決しようとする課題】しかしながら、前記従来の表面伝導型電子放出素子においては、通電によるフォーミング処理の際に発生する熱が素子構成部材に様々な影響を及ぼし、結果として電子放出特性への影響も生じていた。

【００１２】本発明は上記フォーミング処理時の発熱による素子への影響を防止しようとするものであり、上記フォーミング処理時の発熱の低減を図り、該発熱による素子構成部材及び電子放出特性への影響を低減し、より信頼性の高い電子放出素子及び電子源、更にはこれを用いた画像形成用パネル並びに画像形成装置を提供することを目的とする。

【００１３】

【課題を解決するための手段】上記目的を達成すべく成された本発明の構成は以下の通りである。

【００１４】即ち、本発明の第一は、電極間に、電子放出部を有する導電性膜を備える電子放出素子の製造方法において、導電性膜への逆圧電効果により、該導電性膜に電子放出部を形成する工程を有することを特徴とする電子放出素子の製造方法にある。

【００１５】上記本発明第一は、さらにその特徴として、「前記導電性膜への通電処理により該導電性膜に電子放出部を形成する工程を有する」ことを含む。

【００１６】また、本発明の第二は、電極間に、電子放出部を有する導電性膜を備える電子放出素子の製造方法において、導電性膜に付設された圧電体に電圧を印加する工程を有することを特徴とする電子放出素子の製造方法にある。

【００１７】上記本発明第二は、さらにその特徴として、「前記導電性膜に通電処理を行う工程を有する」ことを含む。

【００１８】また、本発明の第三は、電子放出素子と該電子放出素子の駆動手段とを有する電子源の製造方法において、前記電子放出素子が、前記本発明第一又は第二の方法にて製造されることを特徴とする電子源の製造方法にある。

【００１９】上記本発明第三は、さらにその特徴として、「前記電子源は、複数の電子放出素子が並列に結線された素子列を少なくとも１列以上有する電子源であ

【００２１】上記本発明第四は、さらにその特徴として、「前記画像形成用パネルは、複数の電子放出素子が並列に結線された素子列を少なくとも１列以上有する画像形成用パネルである」こと、「前記画像形成用パネルは、複数の電子放出素子が並列に結線された素子列の複数列がマトリクス配置されている画像形成用パネルである」こと、「前記画像形成部材が、蛍光体である」こと、をも含むものである。

【００２２】また、本発明の第五は、電子放出素子と、画像形成部材と、前記電子放出素子から放出される電子線の前記画像形成部材への照射を情報信号に応じて制御する駆動手段とを有する画像形成装置の製造方法において、前記電子放出素子が、前記本発明第一又は第二の方法にて製造されることを特徴とする画像形成装置の製造方法にある。

【００２３】上記本発明第五は、さらにその特徴として、「前記画像形成装置は、複数の電子放出素子が並列に結線された素子列を少なくとも１列以上有する画像形成装置である」こと、「前記画像形成装置は、複数の電子放出素子が並列に結線された素子列の複数列がマトリクス配置されている画像形成装置である」こと、「前記画像形成部材が、蛍光体である」こと、をも含むものである。

【００２４】更に、本発明は、上記本発明第一～第五の製法によって得られる電子放出素子、電子源、画像形成用パネル及び画像形成装置に関する。

【００２５】

【発明の実施の形態】上記のように、本発明は、新規な電子放出素子、該電子放出素子を複数個備えた新規な電子源、これを用いた新規な画像形成用パネル及び画像形成装置に係るもので、各発明の構成及び作用を以下に更に説明する。

【００２６】本発明に係る電子放出素子の一例を図１に示す。図１に示した電子放出素子は、平面型の表面伝導型電子放出素子であり、図中１は基板、２は電子放出部、３は導電性膜、４と５は素子電極、６は圧電体電極７と圧電体層４で構成される圧電体である。

【００２７】基板１としては、例えば石英ガラス、Ｎａ等の不純物含有量を減少させたガラス、青板ガラス、青板ガラスにスパッタ法等によりＳｉＯ２を積層した積層体、アルミナ等のセラミックス等が挙げられる。

【００２８】対向する素子電極４，５及び圧電体電極７の材料としては、一般導体材料が用いられ、例えば

Ｎ、ＰｂＴｉＯ３、ＢａＴｉＯ３、ＰＺＴ等が用いられ、その厚さは１００ｎｍから１０μｍ程度で、５００ｎｍから３μｍ程度が好ましい。

【００３０】素子電極間隔Ｌ、素子電極長さＷ、導電性膜３の形状等は、応用される形態等によって設計される。

【００３１】素子電極間隔Ｌは、数百オングストロームから数百マイクロメートルであることが好ましく、より好ましくは、素子電極４、５間に印加する電圧等により、数マイクロメートルから数十マイクロメートルである。

【００３２】素子電極長さＷは、電極の抵抗値や電子放出特性を考慮すると、好ましくは数マイクロメートルから数百マイクロメートルであり、また素子電極厚ｄは、数百オングストロームから数マイクロメートルである。

【００３３】尚、図１に示される表面伝導型電子放出素子は、基板１上に、圧電体６、素子電極４，５、導電性膜３の順に積層されたものとなっているが、基板１上に、圧電体６、導電性膜３、素子電極４，５の順に積層したものとしてもよい。

【００３４】導電性膜３は、良好な電子放出特性を得るためには、微粒子で構成された微粒子膜であることが特に好ましく、その膜厚は、素子電極４、５へのステップカバレージ、素子電極４、５間の抵抗値及び後述する通電処理条件、圧電体への電圧印加条件等によって適宜選択される。この導電性膜３の膜厚は、好ましくは数オングストロームから数千オングストロームで、特に好ましくは１０オングストロームから５００オングストロームであり、その抵抗値は、１０の３乗から１０の７乗オーム／□のシート抵抗値である。

【００３５】導電性膜３を構成する材料としては、例えばＰｄ，Ｐｔ，Ｒｕ，Ａｇ，Ａｕ，Ｔｉ，Ｉｎ，Ｃｕ，Ｃｒ，Ｆｅ，Ｚｎ，Ｓｎ，Ｔａ，Ｗ，Ｐｂ等の金属、ＰｄＯ，ＳｎＯ２，Ｉｎ２Ｏ３，ＰｂＯ，Ｓｂ２Ｏ３等の酸化物、ＨｆＢ２，ＺｒＢ２，ＬａＢ６，ＣｅＢ６，ＹＢ６，ＧｄＢ６等の硼化物、ＴｉＣ，ＺｒＣ，ＨｆＣ，ＴａＣ，ＳｉＣ，ＷＣなどの炭化物、ＴｉＮ，ＺｒＮ，ＨｆＮ等の窒化物、Ｓｉ，Ｇｅ等の半導体、カーボン等が挙げられる。

【００３６】尚、上記微粒子膜とは、複数の微粒子が集合した膜であり、その微細構造として、微粒子が個々に分散配置した状態のみならず、微粒子が互いに隣接、あ

子放出部2及び亀裂自体は、導電性膜3の膜厚、膜質、材料及び後述する通電処理条件、圧電体への電圧印加条件等の製法に依存して形成される。従って、電子放出部2の位置及び形状は図1に示されるような位置及び形状に特定されるものではない。

【0038】亀裂内部には、数オングストロームから数百オングストロームの粒径の導電性微粒子を有することもある。この導電性微粒子は、導電性膜3を構成する材料の元素の一部、あるいは総てと同様のものである。また、亀裂をさむ電子放出部2及びその近傍の導電性膜3は炭素及び炭素化合物を有することもある。

【0039】次に、垂直型の電子放出素子の基本的な構成について説明する。

【0040】図2は、垂直型の表面伝導型電子放出素子の基本的な構成を示す図で、図1と同じ符号は同じ部材を示すものである。

【0041】基板1、電子放出部2、導電性膜3、素子電極4，5，圧電体6は、前述した平面型の電子放出素子と同様の材料で構成されたものであり、導電性膜3を圧電体6の側面と素子電極4，5間とに設ける点などを除いて、前述と同様の方法にて作製される。

【0042】圧電体6の膜厚は、先に述べた平面型の電子放出素子の素子電極間隔L（図1参照）に対応するもので、好ましくは数百オングストロームから数十マイクロメートルであり、特に好ましくは数百オングストロームから数マイクロメートルである。

【0043】また、平面型の電子放出素子の説明においても述べたように、電子放出部2の形成は、導電性膜3の膜厚、膜質、材料及び後述するフォーミング条件、圧電体への電圧印加条件等の製法に依存するので、その位置及び形状は図2に示されるような位置及び形状に特定されるものではない。

【0044】尚、以下の説明は、上述の平面型の電子放出素子と垂直型の電子放出素子の内、平面型を例にして説明するが、平面型の電子放出素子に代えて垂直型の電子放出素子としてもよい。

【0045】図1に示した様な表面伝導型電子放出素子の製法としては様々な方法が考えられるが、その一例を図3に基づいて説明する。尚、図3において図1と同じ符号は同じ部材を示すものである。

【0046】1）基板1上に、圧電体6を形成する。例えば、基板1に、真空蒸着法、スパッタ法等により圧電

板1上に有機金属溶液を塗布して放置することにより、素子電極4と素子電極5間を連絡して有機金属薄膜を形成する。尚、有機金属溶液とは、前述の導電性膜3の構成材料の金属を主元素とする有機化合物の溶液である。この後、有機金属薄膜を加熱焼成処理し、リフトオフ、エッチング等によりパターニングされた導電性膜3を形成する（図3（b））。

【0048】尚、ここでは、有機金属溶液の塗布法により説明したが、これに限ることなく、例えば真空蒸着法、スパッタ法、化学的気相堆積法、分散塗布法、ディッピング法、スピンナー法等によって有機金属膜を形成することもできる。

【0049】3）続いて、フォーミング工程を施す。

【0050】素子電極4，5間に通電すると共に、圧電体6の圧電体電極7に電圧を印加することにより、導電性膜3を局所的に破壊、変形もしくは変質せしめ、構造の変化した電子放出部2を形成する（図3（c））。つまり、圧電体6に電圧を印加することにより生ずる逆圧電効果を利用して、該圧電体6に付設されている導電性膜3に機械的な歪みを発生させ、この歪みによって該導電性膜3に電子放出部2を形成する。

【0051】このように本発明では、逆圧電効果により導電性膜3に機械的な歪みを発生させることで、従来と同様の通電フォーミング時の導電性膜の局所的な破壊、変形もしくは変質を助長することにより、通電フォーミング時の発熱量を低減させ、該発熱による素子構成部材及び電子放出特性への影響を低減できるものである。

【0052】尚、上記歪みの大きさは、用いる圧電体材料や圧電体に印加する電圧により適宜制御することができるので、電子放出部2の形状の制御も可能である。

【0053】上記通電フォーミングにおける素子電極4，5間に印加する電圧波形の例を図5に示す。

【0054】電圧波形は、特にパルス波形が好ましく、パルス波高値を定電圧とした電圧パルスを連続的に印加する場合（図5（a））と、パルス波高値を増加させながら電圧パルスを印加する場合（図5（b））とがある。

【0055】まず、パルス波高値を定電圧とした場合について図5（a）で説明する。

【0056】図5（a）におけるT1及びT2は電圧波形のパルス幅とパルス間隔であり、例えば、T1を1マイクロ秒～10ミリ秒、T2を10マイクロ秒～100

出素子の抵抗値等に合わせて所望の値を選択することができる。

【００５７】次に、パルス波高値を増加させながら素圧パルスを印加する場合について図５（ｂ）で説明する。

【００５８】図５（ｂ）におけるＴ１及びＴ２は図５（ａ）と同様であり、波高値（フォーミング時のピーク素圧）を、例えば０．１Ｖステップ程度ずつ増加させ、図５（ａ）の説明と同様の適当な真空雰囲気下で印加する。

【００５９】尚、パルス間隔Ｔ２中に、導素性膜３を局所的に破壊、変形もしくは変質させない程度の電圧、例えば０．１Ｖ程度の素圧で素子素流を測定して抵抗値を求め、例えば１Ｍオーム以上の抵抗を示したときにフォーミングを終了することが好ましい。

【００６０】上記フォーミング工程からそれ以降の工程は、図６に示されるような測定評価系内で行うことができる。この測定評価系について説明する。

【００６１】図６において、図１と同じ符号は同じ部材を示す。また、５１は素子に素子素圧Ｖｆを印加するための電源、５０は素子素極４，５間の導素性膜３を流れる素子素流Ｉｆを測定するための素流計、５４は電子放出部２より放出される放出電流Ｉｅを捕捉するためのアノード素極、５３はアノード素極５４に素圧を印加するための高圧素源、５２は電子放出部２より放出される放出電流Ｉｅを測定するための素流計、５５は真空装置、５６は排気ポンプである。

【００６２】電子放出素子及びアノード素極５４等は真空装置５５内に設置され、この真空装置５５には不図示の真空計等の必要な機器が具備されていて、所望の真空下で電子放出素子の測定評価ができるようになっている。

【００６３】排気ポンプ５６は、ターボポンプ、ロータリーポンプ等からなる通常の高真空装置系と、イオンポンプ等からなる超高真空装置系とから構成されている。また、真空装置５５全体及び素子放出素子の基板１は、ヒーターにより２００℃程度まで加熱できるようになっている。尚、この測定評価系は、後述するような表示パネルの組み立て段階において、表示パネル及びその内部を真空装置５５及びその内部として構成することで、フォーミング工程及び後述するそれ以後の工程における測定評価及び処理に応用されるものである。

【００６４】４）更に活性化工程を施すことが好ましい。

定しながら行って、例えば放出素流が飽和した時点で終了するようにすれば効果的であるので好ましい。また、活性化工程でのパルス波高値は、好ましくは駆動電圧の波高値である。

【００６６】尚、上記炭素及び炭素化合物とは、グラファイト（単結晶及び多結晶の双方を指す）、非晶質カーボン（非晶質カーボン及びこれと多結晶グラファイトとの混合物を指す）である。また、その堆積膜厚は、好ましくは５００オングストローム以下、より好ましくは３００オングストローム以下である。

【００６７】５）このようにして作製した素子放出素子を、フォーミング工程、活性化工程での真空度より高い真空度の真空雰囲気下で動作駆動する。安定化工程を施すことが好ましい。より好ましくは、この高い真空度の真空雰囲気下で、８０～１５０℃の加熱の後、動作駆動する。

【００６８】尚、フォーミング工程、活性化工程の真空度より高い真空度の真空雰囲気とは、例えば約１０の－６乗ｔｏｒｒ以上の真空度を有する真空雰囲気であり、より好ましくは超高真空系であり、炭素及び炭素化合物が新たにほぼ堆積しない真空度である。即ち、電子放出素子を上記真空雰囲気中に封入してしまうことにより、これ以上の炭素及び炭素化合物の堆積を抑制することが可能となり、これによって素子素流Ｉｆ、放出電流Ｉｅが安定する。

【００６９】上述のような素子構成と製造方法によって作製された表面伝導型素子放出素子の基本特性について以下に説明する。

【００７０】以下に述べる表面伝導型電子放出素子の基本特性は、図６の測定評価系のアノード素極５４の素圧を１ｋＶ～１０ｋＶとし、アノード電極５４と表面伝導型電子放出素子の距離Ｈを２～８ｍｍとして、通常測定を行う。

【００７１】まず、放出電流Ｉｅ及び素子素流Ｉｆと、素子電圧Ｖｆとの関係の典型的な例を図７に示す。尚、図７の（ａ）において、放出素流Ｉｅは素子素流Ｉｆに比べて著しく小さいので、任意単位で示されている。

【００７２】図７の（ａ）から明らかなように、表面伝導型電子放出素子は、放出電流Ｉｅに対する次の３つの特徴的特性を有する。

【００７３】まず第１に、表面伝導型電子放出素子はある電圧（しきい値素圧と呼ぶ：図７の（ａ）中のＶｔ

【００７５】第3に、アノード電極５４（図６参照）に捕捉される放出電荷は、素子電圧Ｖｆを印加する時間に依存する。即ち、アノード電極５４に捕捉される電荷量は、素子電圧Ｖｆを印加する時間により制御できる。

【００７６】放出電流Ｉｅが素子電圧Ｖｆに対してＭＩ特性を有すると同時に、素子電流Ｉｆも素子電圧Ｖｆに対してＭＩ特性を有する場合もある。このような表面伝導型電子放出素子の特性の例が図７の（ａ）に示す特性である。一方、図７の（ｂ）に示すように、素子電流Ｉｆは素子電圧Ｖｆに対して電圧制御型負性抵抗特性（ＶＣＮＲ特性と呼ぶ）を示す場合もある。いずれの特性を示すかは、表面伝導型電子放出素子の製法及び測定時の測定条件等に依存する。但し、素子電流Ｉｆが素子電圧Ｖｆに対してＶＣＮＲ特性を有する表面伝導型電子放出素子でも、放出電流Ｉｅは素子電圧Ｖｆに対してＭＩ特性を有する。

【００７７】以上のような表面伝導型電子放出素子の特徴的特性のため、複数の素子を配置した電子源や画像形成装置でも、入力信号に応じて、容易に放出電子量を制御することができることとなり、多方面への応用が可能である。

【００７８】次に、本発明の電子源の一例として前述の表面伝導型電子放出素子を複数配置した電子源について述べる。まず、表面伝導型電子放出素子の配列方式について説明する。

【００７９】本発明の電子源における電子放出素子の配列方式としては、従来の技術の項で述べたような梯型配置の他、ｍ本のＸ方向配線の上にｎ本のＹ方向配線を層間絶縁層を介して設置し、表面伝導型電子放出素子の一対の素子電極に夫々Ｘ方向配線、Ｙ方向配線を接続した配置方式が挙げられる。これを以後単純マトリクス配置と呼ぶ。

【００８０】前述した表面伝導型電子放出素子の基本的特性によれば、多数の表面伝導型電子放出素子を単純マトリクス配置した場合においても、個々の素子に上記パルス状電圧を適宜印加すれば、入力信号に応じて表面伝導型電子放出素子を選択し、その電子放出量が制御でき、単純なマトリクス配線だけで個別の表面伝導型電子放出素子を選択して独立に駆動可能となる。

【００８１】単純マトリクス配置はこのような原理に基づくもので、本発明の電子源の一例である、この単純マトリクス配置の電子源の構成について図８に基づいて更に説明する。

電性金属等である。また、多数の表面伝導型電子放出素子１０４にほぼ均等に電圧が供給されるように、材料、膜厚、配線幅が設定されている。

【００８４】ｎ本のＹ方向配線１０３は、夫々外部端子Ｄｙ１，Ｄｙ２，……，Ｄｙｎを有するもので、Ｘ方向配線１０２と同様に作成される。

【００８５】これらｍ本のＸ方向配線１０２とｎ本のＹ方向配線１０３間には、不図示の層間絶縁層が設置され、電気的に分離されて、マトリクス配線を構成している。尚、このｍ、ｎは共に正の整数である。

【００８６】不図示の層間絶縁層は、真空蒸着法、印刷法、スパッタ法等で形成されたＳｉＯ２等であり、Ｘ方向配線１０２を形成した基板１の全面或は一部に所望の形状で形成され、特に、Ｘ方向配線１０２とＹ方向配線１０３の交差部の電位差に耐え得るように、膜厚、材料、製法が適宜設定される。Ｘ方向配線１０２とＹ方向配線１０３は、それぞれ外部端子として引き出されている。

【００８７】更に、表面伝導型電子放出素子１０４の対向する素子電極（不図示）が、ｍ本のＸ方向配線１０２と、ｎ本のＹ方向配線１０３と、真空蒸着法、印刷法、スパッタ法等で形成された導電性金属等からなる結線１０５によって電気的に接続されているものである。

【００８８】ここで、ｍ本のＸ方向配線１０２と、ｎ本のＹ方向配線１０３と、結線１０５と、対向する素子電極とは、その構成元素の一部あるいは全部が同一であっても、また夫々異なっていてもよく、前述の素子電極の材料等より適宜選択される。これら素子電極への配線は、素子電極と材料が同一である場合は素子電極と総称する場合もある。また、表面伝導型電子放出素子１０４は、基板１あるいは不図示の層間絶縁層上どちらに形成してもよい。

【００８９】また、詳しくは後述するが、前記Ｘ方向配線１０２には、Ｘ方向に配列された表面伝導型電子放出素子１０４の行を入力信号に応じて走査するために、走査信号を印加する不図示の走査信号印加手段が電気的に接続されている。

【００９０】一方、Ｙ方向配線１０３には、Ｙ方向に配列された表面伝導型電子放出素子１０４の列の各列を入力信号に応じて変調するために、変調信号を印加する不図示の変調信号発生手段が電気的に接続されている。更に、各表面伝導型電子放出素子１０４に印加される駆動

ＮＴＳＣ方式のテレビ信号に応じてテレビジョン表示を行うための駆動回路の一例を示すブロック図である。

【００９２】図９において．１は上述のようにして表面伝導型電子放出素子を配置した電子源の基板、１１１は基板１を固定したリアプレート、１１６はガラス基板１１３の内面に蛍光膜１１４とメタルバック１１５等が形成されたフェースプレート．１１２は支持枠であり、リアプレート１１１、支持枠１１２及びフェースプレート１１６にフリットガラス等を塗布し．大気中あるいは窒素中で、４００～５００℃で１０分以上焼成することで封着して外囲器１１８を構成している。

【００９３】図９において．１０２．１０３は．表面伝導型電子放出素子１０４の素子電極４．５と接続されたＸ方向配線及びＹ方向配線で、夫々外部端子Ｄｘ１ないしＤｘｍ，Ｄｙ１ないしＤｙｎを有している。

【００９４】外囲器１１８は、上述の如く、フェースープレート１１６．支持枠１１２、リアプレート１１１で構成されている。しかし．リアプレート１１１は主に基板１の強度を補強する目的で設けられるものであり、基板１自体で十分な強度を持つ場合は別体のリアプレート１１１は不要で．基板１に直接支持枠１１２を封着し、フェースプレート１１６．支持枠１１２、基板１にて外囲器１１８を構成してもよい。また．フェースプレート１１６、リアプレート１１１の間にスペーサーと呼ばれる不図示の支持体を更に設置することで、大気圧に対して十分な強度を有する外囲器１１８とすることもできる。

【００９５】蛍光膜１１４は、モノクロームの場合は蛍光体１２２のみからなるが．カラーの蛍光膜１１４の場合は．蛍光体１２２の配列により、ブラックストライプ（図１０（ａ））あるいはブラックマトリクス（図１０（ｂ））等と呼ばれる黒色導伝材１２１と蛍光体１２２とで構成される。ブラックストライプ．ブラックマトリクスが設けられる目的は．カラー表示の場合必要となる三原色の各蛍光体１２２間の塗り分け部を黒くすることで混色等を目立たなくすることと、蛍光膜１１４における外光反射によるコントラストの低下を抑制することである。黒色導伝材１２１の材料としては、通常良く用いられている黒鉛を主成分とする材料だけでなく．導電性があり、光の透過及び反射が少ない材料であれば他の材料を用いることもできる。

【００９６】ガラス基板１１３に蛍光体１２２を塗布す

こと．外囲器１１８内で発生した負イオンの衝突によるダメージからの蛍光体１２２の保護等である。メタルバック１１５は．蛍光膜１１４の作製後．蛍光膜１１４の内面側表面の平滑化処理（通常フィルミングと呼ばれる）を行い、その後Ａｌを真空蒸着等で堆積することで作製できる。

【００９８】フェースプレート１１６には、更に蛍光膜１１４の導伝性を高めるため、蛍光膜１１４の外面側に透明電極（不図示）を設けてもよい。

【００９９】前述の封着を行う際、カラーの場合は各色蛍光体１２２と表面伝導型電子放出素子１０４とを対応させなくてはいけないため．十分な位置合わせを行なう必要がある。

【０１００】外囲器１１８内は、不図示の排気管を通じて排気し、所定の真空度に達した後．封止される。また．外囲器１１８の封止後の真空度を維持するためにゲッター処理を行うこともできる。これは、外囲器１１８の封止を行う直前あるいは封止後に抵抗加熱あるいは高周波加熱等により、外囲器１１８内の所定の位置に配置したゲッター（不図示）を加熱し、蒸着膜を形成する処理である。ゲッターは通常Ｂａ等が主成分であり．該蒸着膜の吸着作用により、例えば１×１０の－５乗ないしは１×１０の－７乗ｔｏｒｒの真空度を維持するためのものである。ここで、表面伝導型電子放出素子のフォーミング処理以降の工程は．適宜設定できる。

【０１０１】上述の表示パネル２０１は、例えば図１１に示されるような駆動回路で駆動することができる。尚．図１１において、２０１は表示パネル、２０２は走査回路、２０３は制御回路．２０４はシフトレジスタ、２０５はラインメモリ、２０６は同期信号分離回路、２０７は変調信号発生器、Ｖｘ及びＶａは直流電圧源である。

【０１０２】図１１に示されるように．表示パネル２０１は．外部端子Ｄｘ１ないしＤｘｍ．外部端子Ｄｙ１ないしＤｙｎ及び高圧端子Ｈｖを介して外部の電気回路と接続されている。この内．外部端子Ｄｘ１ないしＤｘｍには前記表示パネル２０１内に設けられている表面伝導型電子放出素子．即ちｍ行ｎ列の行列状にマトリクス配置された表面伝導型電子放出素子群を１行（ｎ素子ずつ）順次駆動して行くための走査信号が印加される。

【０１０３】一方、端子Ｄｙ１ないし外部端子Ｄｙｎには．前記走査信号により選択された１行の各表面伝導型

備えるもので．各スイッチング素子Ｓ１～Ｓｍは．直流高圧電源Ｖｘの出力高圧もしくは０Ｖ（グランドレベル）のいずれか一方を選択して、表示パネル２０１の外部端子Ｄｘ１ないしＤｘｍと高気的に接続するものである。各スイッチング素子Ｓ１～Ｓｍは．制御回路２０３が出力する制御信号Ｔｓｃａｎに基づいて動作するもので．実際には．例えばＦＥＴのようなスイッチング機能を有する素子を組み合わせることにより容易に構成することが可能である。

【０１０５】本例における前記直流電圧源Ｖｘは．前記表面伝導型電子放出素子の特性（しきい値高圧）に基づき．走査されていない表面伝導型電子放出素子に印加される駆動高圧がしきい値電圧以下となるような一定高圧を出力するよう設定されている。

【０１０６】制御回路２０３は、外部より入力される画像信号に基づいて適切な表示が行われるように．各部の動作を整合させる働きを持つものである。次に説明する同期信号分離回路２０６より送られる同期信号Ｔｓｙｎｃに基づいて．各部に対してＴｓｃａｎ、Ｔｓｆｔ及びＴｍｒｙの各制御信号を発生する。

【０１０７】同期信号分離回路２０６は、外部から入力されるＮＴＳＣ方式のテレビ信号から．同期信号成分と輝度信号成分を分離するための回路で．よく知られているように、周波数分離（フィルター）回路を用いれば、容易に構成できるものである。同期信号分離回路２０６により分離された同期信号は、これもよく知られるように．垂直同期信号と水平同期信号よりなる。ここでは、説明の便宜上Ｔｓｙｎｃとして図示する。一方．前記テレビ信号から分離された画像の輝度信号成分を便宜上ＤＡＴＡ信号と図示する。このＤＡＴＡ信号はシフトレジスタ２０４に入力される。

【０１０８】シフトレジスタ２０４は．時系列的にシリアル入力される前記ＤＡＴＡ信号を．画像の１ライン毎にシリアル／パラレル変換するためのもので、前記制御回路２０３より送られる制御信号Ｔｓｆｔに基づいて作動する。この制御信号Ｔｓｆｔは、シフトレジスタ２０４のシフトクロックであると言い換えてもよい。また、シリアル／パラレル変換された画像１ライン分（表面伝導型電子放出素子のｎ素子分の駆動データに相当する）のデータは、Ｉｄ１ないしＩｄｎのｎ個の並列信号として前記シフトレジスタ２０４より出力される。

【０１０９】ラインメモリ２０５は．画像１ライン分の

で．その出力信号は、端子Ｄｙ１ないしＤｙｎを通じて表示パネル２０１内の表面伝導型電子放出素子に印加される。

【０１１１】前述したように、表面伝導型電子放出素子は電子放出に明確なしきい値高圧を有しており．しきい値電圧を超える電圧が印加された場合にのみ電子放出が生じる。また．しきい値電圧を超える電圧に対しては表面伝導型電子放出素子への印加高圧の変化に応じて放出高流も変化して行く。表面伝導型電子放出素子の材料、構成．製造方法を変えることにより．しきい値電圧の値や印加高圧に対する放出電流の変化度合いが変わる場合もあるが、いずれにしても以下のことがいえる。

【０１１２】即ち、表面伝導型電子放出素子にパルス状の電圧を印加する場合、例えばしきい値高圧以下の高圧を印加しても電子放出は生じないが．しきい値電圧を超える電圧を印加する場合には電子放出を生じる。その際．第１には電圧パルスの波高値を変化させることにより．出力される電子ビームの強度を制御することが可能である。第２には、高圧パルスの幅を変化させることにより．出力される電子ビームの高荷の総量を制御することが可能である。

【０１１３】従って、入力信号に応じて表面伝導型電子放出素子を変調する方式としては、電圧変調方式とパルス幅変調方式とが挙げられる。高圧変調方式を行う場合．変調信号発生器２０７としては．一定の長さの高圧パルスを発生するが、入力されるデータに応じて適宜パルスの波高値を変調できる電圧変調方式の回路を用いる。また、パルス幅変調方式を行う場合、変調信号発生器２０７としては、一定の波高値の電圧パルスを発生するが．入力されるデータに応じて適宜パルス幅を変調できるパルス幅変調方式の回路を用いる。

【０１１４】シフトレジスタ２０４やラインメモリ２０５は．デジタル信号式のものでもアナログ信号式のものでもよく、画像信号のシリアル／パラレル変換や記憶が所定の速度で行えるものであればよい。

【０１１５】デジタル信号式を用いる場合には．同期信号分離回路２０６の出力信号ＤＡＴＡをデジタル信号化する必要がある。これは同期信号分離回路２０６の出力部にＡ／Ｄ変換器を設けることで行える。

【０１１６】また、これと関連して．ラインメモリ２０５の出力信号がデジタル信号かアナログ信号かにより、変調信号発生器２０７に設けられる回路が若干異なるも

る比較器（コンパレータ）を組み合わせた回路を用いることで容易に構成することができる。更に、必要に応じて、比較器の出力するパルス幅変調された変調信号を表面伝導型電子放出素子の駆動電圧にまで電圧増幅するための増幅器を付け加えてもよい。

【０１１８】一方、アナログ信号で電圧変調方式の場合、変調信号発生器２０７には、例えばよく知られているオペアンプ等を用いた増幅回路を用いればよく、必要に応じてレベルシフト回路等を付け加えてもよい。また、アナログ信号でパルス幅変調方式の場合、例えばよく知られている電圧制御型発振回路（ＶＣＯ）を用いればよく、必要に応じて表面伝導型電子放出素子の駆動電圧にまで電圧増幅するための増幅器を付け加えてもよい。

【０１１９】以上のような表示パネル２０１及び駆動回路を有する本発明の画像形成装置は、端子Ｄｘ１～Ｄｘｍ及びＤｙ１～Ｄｙｎから電圧を印加することにより、必要な表面伝導型電子放出素子から電子を放出させることができ、高圧端子Ｈｖを通じて、メタルバック１１５あるいは透明電極（不図示）に高電圧を印加して電子ビームを加速し、加速した電子ビームを蛍光膜１１４に衝突させることで生じる励起・発光によって、ＮＴＳＣ方式のテレビ信号に応じてテレビジョン表示を行うことができるものである。

【０１２０】尚、以上説明した構成は、表示等に用いられる本発明の画像形成装置を得る上で必要な概略構成であり、例えば各部材の材料等、詳細な部分は上述の内容に限られるものではなく、画像形成装置の用途に適するよう、適宜選択されるものである。また、入力信号としてＮＴＳＣ方式を挙げたが、本発明に係る画像形成装置はこれに限られるものではなく、ＰＡＬ、ＳＥＣＡＭ方式等の他の方式でもよく、更にはこれらよりも多数の走査線からなるＴＶ信号、例えばＭＵＳＥ方式を初めとする高品位ＴＶ方式でもよい。

【０１２１】次に、前述の梯型配置の電子源及びこれを用いた本発明の画像形成装置の一例について図１２及び図１３を用いて説明する。

【０１２２】図１２において、１は基板、１０４は表面伝導型電子放出素子、３０４は表面伝導型電子放出素子１０４を接続する共通配線で１０本設けられており、各々外部端子Ｄ１～Ｄ１０を有している。

【０１２３】表面伝導型電子放出素子１０４は、基板１

せたくない素子行にはしきい値電圧以下の電圧を印加するようにすればよい。このような駆動電圧の印加は、各素子行間に位置する共通配線Ｄ２～Ｄ９について、夫々相隣接する共通配線３０４．即ち夫々相隣接する外部端子Ｄ２とＤ３、Ｄ４とＤ５、Ｄ６とＤ７，Ｄ８とＤ９の共通配線３０４を一体の同一配線としても行うことができる。

【０１２５】図１３は、本発明の電子源の他の例である．上記梯型配置の電子源を備えた表示パネル３０１の構造を示す図である。

【０１２６】図１３中３０２はグリッド電極、３０３は電子が通過するための開口．Ｄ１～Ｄｍは各表面伝導型電子放出素子に電圧を印加するための外部端子．Ｇ１～Ｇｎはグリッド電極３０２に接続された外部端子である。また、各素子行間の共通配線３０４は一体の同一配線として基板１上に形成されている。

【０１２７】尚．図１３において図９と同じ符号は同じ部材を示すものであり、図９に示される単純マトリクス配置の電子源を用いた表示パネル２０１との大きな違いは、基板１とフェースプレート１１６の間にグリッド電極３０２を備えている点である。

【０１２８】基板１とフェースプレート１１６の間には、上記のようにグリッド電極３０２が設けられている。このグリッド電極３０２は、表面伝導型電子放出素子１０４から放出された電子ビームを変調することができるもので、梯型配置の素子行と直行して設けられたストライプ状の電極に、電子ビームを通過させるために、各表面伝導型電子放出素子１０４に対応して１個ずつ円形の開口３０３を設けたものとなっている。

【０１２９】グリッド電極３０２の形状や配置位置は、必ずしも図１３に示すようなものでなければならないものではなく、開口３０３をメッシュ状に多数設けることもあり、またグリッド電極３０２を、例えば表面伝導型電子放出素子１０４の周囲や近傍に設けてもよい。

【０１３０】外部端子Ｄ１～Ｄｍ及びＧ１～Ｇｎは不図示の駆動回路に接続されている。そして、素子行を１列ずつ順次駆動（走査）して行くのと同期してグリッド電極３０２の列に画像１ライン分の変調信号を印加することにより、各電子ビームの蛍光膜１１４への照射を制御し、画像を１ラインずつ表示することができる。

【０１３１】以上のように、本発明の画像形成装置は、単純マトリクス配置及び梯型配置のいずれの本発明の電

のではなく、本発明の目的が達成される範囲内での各要素の置換や設計変更がなされたものをも包含する。

【0133】（実施例1）本実施例の表面伝導型電子放出素子の構成は、図1に示されるものと同様であり、図3の製造工程図に基づきその製造方法を以下に説明する。

【0134】工程－a

十分に洗浄した青板ガラス基板1を用い、真空蒸着法により厚さ10ナノメートルのAlを堆積後、フォトリソグラフィ法によりパターニングを行い圧電体電極7を形成した。更に、スパッタ法により厚さ30ナノメートルのZnOを堆積させて圧電体層8を形成した（図3（a））。

【0135】工程－b

次に、真空蒸着法により厚さ5ナノメートルのTi、厚さ100ナノメートルのNiを順次堆積し、フォトリソグラフィ法によりパターニングを行い、素子電極間隔Lが3マイクロメートル、幅W2が300マイクロメートルの素子電極4、5を形成した。更に、有機Pd錯体（ccp4230・奥野製薬（株）製）をスピンナーに*

*より回転塗布し、300℃で10分間の加熱焼成処理を行い導電性薄膜3を形成した後、フォトリソグラフィ法により、図3（b）に示すような形状にパターニングした。

【0136】工程－c

上記工程を経た基板1を図6の測定評価系に設置し、真空ポンプにて排気して、2×10の－5乗torrの真空度に達した後、素子電圧Vfを印加するための電源51より素子電極4、5間に電圧を印加し通電処理（フォーミング処理）を施すと共に、圧電体電極7に電圧を印加して電子放出部2を形成した（図3（c））。

【0137】具体的には、上記の工程で作製した7つの素子について、表1に示される条件でフォーミング処理を行った。

【0138】その結果、いずれの場合も電子放出部2が形成され、従来の素子電極4、5間への通電だけによるフォーミング処理方法にくらべ、フォーミング時の発熱量を極めて小さくすることができた。

【0139】

【表1】

素子番号	圧電体電極7への電圧パルス			素子電極4、5間への通電処理の電圧パルス		
	パルス波高値	時間	電流	パルス波高値	時間	電流
1	100(V)	10msec	1mA	3(V)	100msec	10mA
2	100(V)	10msec	1mA	3(V)	50msec	10mA
3	150(V)	10msec	2mA	2(V)	100msec	5mA
4	150(V)	10msec	2mA	2(V)	50msec	5mA
5	150(V)	10msec	2mA	2(V)	10msec	5mA
6	150(V)	10msec	2mA	3(V)	10msec	10mA
7	150(V)	10msec	2mA	3(V)	5msec	10mA

た（図４（ｂ））。

【０１４３】工程－ｃ

次に、有機Ｐｄ錯体（ｃｃｐ４２３０・奥野製薬（株）製）をスピンナーにより回転塗布し、３００℃で１０分間の加熱焼成処理を行い導電性薄膜３を形成した後、フォトリソグラフィ法により、図４（ｃ）に示すような形状にパターニングした。

【０１４４】工程－ｄ

上記工程を経た基板１を図６の測定評価系に設置し、真空ポンプにて排気して、２×１０の－５乗ｔｏｒｒの真空度に達した後、素子電圧Ｖｆを印加するための電源５１より素子電極４，５間に電圧を印加し通電処理（フォーミング処理）を施すと共に、圧電体電極７に電圧を印加して電子放出部２を形成した（図４（ｃ））。

【０１４５】本実施例においても、７つの素子に対して実施例１と同様の条件でフォーミング処理を行ったところ、実施例１と同様に発熱が小さく良好な結果が得られた。

【０１４６】（実施例３）実施例１の電子放出素子を用いて、図８に示したような単純マトリクス配置の電子源、及び図９に示したような画像形成装置を作製した。

【０１４７】電子源の製造は、実施例１の電子放出素子の製造方法を拡張して行うことができ、その詳細は省略する。

【０１４８】次に、上記のように作製した複数の導電性膜がマトリクス配線された基板１（図８）を用いて画像形成装置を構成した例を、図９及び図１０を参照して具体的に説明する。

【０１４９】先ず、上述のようにして複数の導電性膜がマトリクス配線された基板１（図８）をリアプレート１１１上に固定した後、基板１の５ｍｍ上方に、フェースプレート１１６（ガラス基板１１３の内面に蛍光膜１１４とメタルバック１１５が形成されて構成される）を支持枠１１２を介して配置し、フェースプレート１１６、支持枠　１１２、リアプレート１１１の接合部にフリットガラスを塗布し、大気中で４００℃で１０分焼成することで封着した。またリアプレート１１１への基板１の固定もフリットガラスで行った。

【０１５０】蛍光膜１１４は、モノクロームの場合は蛍光体１２２のみからなるが、本実施例では蛍光体１２２はストライプ形状（図１０（ａ））を採用し、先にブラックストライプを形成し、その間隙部に各色蛍光体１２

る）を行い、その後、Ａｌを真空蒸着することで作製した。

【０１５２】フェースプレート１１６には、更に蛍光膜１１４の導伝性を高めるため、蛍光膜１１４の外面側に透明電極（不図示）が設けられる場合もあるが、本実施例では、メタルバック１１５のみで十分な導伝性が得られたので省略した。

【０１５３】前述の封着を行う際、カラーの場合は各色蛍光体１２２と表面伝導型電子放出素子１０４とを対応させなくてはいけないため、十分な位置合わせを行った。

【０１５４】以上のようにして完成した外囲器１１８内の雰囲気を排気管（図示せず）を通じ、十分な排気を行った後、外部端子Ｄｘ１ないしＤｘｍとＤｙ１ないしＤｙｎを通じ、表面伝導型電子放出素子１０４の素子電極４、５間、及び先述の如く各素子に付設された圧電体にそれぞれ電圧を印加することでフォーミング処理を行い、各々の素子に電子放出部を形成した。

【０１５５】続いて、外囲器１１８内の雰囲気を排気管（図示せず）を通じ真空ポンプにて１０の－６．５乗ｔｏｒｒ程度の真空度まで排気し、不図示の排気管をガスバーナーで熱することで溶着し、外囲器１１８の封止を行い、更に封止後の真空度を維持するために、高周波加熱法でゲッター処理を行った。

【０１５６】以上のように完成した本発明の画像形成装置において、外部端子Ｄｘ１ないしＤｘｍとＤｙ１ないしＤｙｎを通じ、走査信号及び変調信号を不図示の信号発生手段より夫々表面伝導型電子放出素子１０４に印加することにより電子放出させると共に、高圧端子Ｈｖを通じてメタルバック１１４に数ｋＶ以上の高圧を印加して、電子ビームを加速し、蛍光膜１１５に衝突させ、励起・発光させることで画像の表示が得られた。

【０１５７】（実施例４）図１４は、前述の表面伝導型電子放出素子を電子源として用いたディスプレイパネルに、例えばテレビジョン放送を初めとする種々の画像情報源より提供される画像情報を表示できるように構成した本発明の画像形成装置の一例を示す図である。

【０１５８】図中２０１はディスプレイパネル、１００１はディスプレイパネルの駆動回路、１００２はディスプレイコントローラ、１００３はマルチプレクサ、１００４はデコーダ、１００５は入出力インターフェース回路、１００６はＣＰＵ、１００７は画像生成回路、１０

情報の受信、分解、再生、処理、記憶等に関する回路やスピーカー等については説明を省略する。

【０１６０】以下、画像信号の流れに沿って各部の機能を説明する。

【０１６１】まず、ＴＶ信号受信回路１０１３は、例えば電波や空間光通信等のような無線伝送系を用いて伝送されるＴＶ信号を受信するための回路である。

【０１６２】受信するＴＶ信号の方式は特に限られるものではなく、例えばＮＴＳＣ方式、ＰＡＬ方式、ＳＥＣＡＭ方式等、いずれの方式でもよい。また、これらより更に多数の走査線よりなるＴＶ信号、例えばＭＵＳＥ方式を初めとする所謂高品位ＴＶは、大面積化や大画素数化に適した前記ディスプレイパネルの利点を生かすのに好適な信号源である。

【０１６３】ＴＶ信号受信回路１０１３で受信されたＴＶ信号は、デコーダ１００４に出力される。

【０１６４】ＴＶ信号受信回路１０１２は、例えば同軸ケーブルや光ファイバー等のような有線伝送系を用いて伝送されるＴＶ信号を受信するための回路である。前記ＴＶ信号受信回路１０１３と同様に、受信するＴＶ信号の方式は特に限られるものではなく、また本回路で受信されたＴＶ信号もデコーダ１００４に出力される。

【０１６５】画像入力インターフェース回路１０１１は、例えばＴＶカメラや画像読み取りスキャナーなどの画像入力装置から供給される画像信号を取り込むための回路で、取り込まれた画像信号はデコーダ１００４に出力される。

【０１６６】画像メモリーインターフェース回路１０１０は、ビデオテープレコーダー（以下ＶＴＲと略す）に記憶されている画像信号を取り込むための回路で、取り込まれた画像信号はデコーダ１００４に出力される。

【０１６７】画像メモリーインターフェース回路１００９は、ビデオディスクに記憶されている画像信号を取り込むための回路で、取り込まれた画像信号はデコーダ１００４に出力される。

【０１６８】画像メモリーインターフェース回路１００８は、静止画ディスクのように、静止画像データを記憶している装置から画像信号を取り込むための回路で、取り込まれた静止画像データはデコーダ１００４に入力される。

【０１６９】入出力インターフェース回路１００５は、本表示装置と、外部のコンピュータもしくはコンピュー

画像データや文字・図形情報や、あるいはＣＰＵ１００６より出力される画像データや文字・図形情報に基づき、表示用画像データを生成するための回路である。本回路の内部には、例えば画像データや文字・図形情報を蓄積するための書き換え可能メモリーや、文字コードに対応する画像パターンが記憶されている読み出し専用メモリーや、画像処理を行うためのプロセッサー等を初めとして、画像の生成に必要な回路が組み込まれている。

【０１７１】本回路により生成された表示用画像データは、デコーダ１００４に出力されるが、場合によっては前記入出力インターフェース回路１００５を介して外部のコンピュータネットワークやプリンターに出力することも可能である。

【０１７２】ＣＰＵ１００６は、主として本表示装置の動作制御や、表示画像の生成や選択や編集に関わる作業を行う。

【０１７３】例えば、マルチプレクサ１００３に制御信号を出力し、ディスプレイパネルに表示する画像信号を適宜選択したり組み合わせたりする。その際には表示する画像信号に応じてディスプレイパネルコントローラ１００２に対して制御信号を発生し、画面表示周波数や走査方法（例えばインターレースかノンインターレースか）や一画面の走査線の数など表示装置の動作を適宜制御する。また、前記画像生成回路１００７に対して画像データや文字・図形情報を直接出力したり、あるいは前記入出力インターフェース回路１００５を介して外部のコンピュータやメモリーをアクセスして画像データや文字・図形情報を入力する。

【０１７４】尚、ＣＰＵ１００６は、これ以外の目的の作業にも関わるものであってよい。例えば、パーソナルコンピュータやワードプロセッサ等のように、情報を生成したり処理する機能に直接関わってもよい。あるいは前述したように、入出力インターフェース回路１００５を介して外部のコンピュータネットワークと接続し、例えば数値計算等の作業を外部機器と協同して行ってもよい。

【０１７５】入力部１０１４は、前記ＣＰＵ１００６に使用者が命令やプログラム、あるいはデータなどを入力するためのものであり、例えばキーボードやマウスの他、ジョイスティック、バーコードリーダー、音声認識装置等の多様な入力機器を用いることが可能である。

【０１７６】デコーダ１００４は、前記１００７ないし

表示が容易になる。あるいは前記画像生成回路１００７及びＣＰＵ１００６と協同して、画像の間引き、補間、拡大、縮小、合成を初めとする画像処理や編集が容易になるという利点が得られる。

【０１７８】マルチプレクサ１００３は、前記ＣＰＵ１００６より入力される制御信号に基づき、表示画像を適宜選択するものである。即ち、マルチプレクサ１００３はデコーダ１００４から入力される逆変換された画像信号の内から所望の画像信号を選択して駆動回路１００１に出力する。その場合には、一画面表示時間内で画像信号を切り換えて選択することにより、所謂多画面テレビのように、一画面を複数の領域に分けて領域によって異なる画像を表示することも可能である。

【０１７９】ディスプレイパネルコントローラ１００２は、前記ＣＰＵ１００６より入力される制御信号に基づき、駆動回路１００１の動作を制御するための回路である。

【０１８０】ディスプレイパネルの基本的な動作に関わるものとして、例えばディスプレイパネルの駆動用電源（図示せず）の動作シーケンスを制御するための信号を駆動回路１００１に対して出力する。ディスプレイパネルの駆動方法に関わるものとして、例えば画面表示周波数や走査方法（例えばインターレースかノンインターレースか）を制御するための信号を駆動回路１００１に対して出力する。また、場合によっては、表示画像の輝度やコントラストや色調やシャープネスといった画質の調整に関わる制御信号を駆動回路１００１に対して出力する場合もある。

【０１８１】駆動回路１００１は、ディスプレイパネル２０１に印加する駆動信号を発生するための回路であり、前記マルチプレクサ１００３から入力される画像信号と、前記ディスプレイパネルコントローラ１００２より入力される制御信号に基づいて動作するものである。

【０１８２】以上、各部の機能を説明したが、図１４に例示した構成により、本画像形成装置においては多様な画像情報源より入力される画像情報をディスプレイパネル２０１に表示することが可能である。即ち、テレビジョン放送を初めとする各種の画像信号は、デコーダ１００４において逆変換された後、マルチプレクサ１００３において適宜選択され、駆動回路１００１に入力される。一方、ディスプレイコントローラ１００２は、表示する画像信号に応じて駆動回路１００１の動作を制御するた

く、表示する画像情報に対して、例えば拡大、縮小、回転、移動、エッジ強調、間引き、補間、色変換、画像の縦横比変換等を初めとする画像処理や、合成、消去、接続、入れ換え、嵌め込み等を初めとする画像編集を行うことも可能である。また、本実施例の説明では特に触れなかったが、上記画像処理や画像編集と同様に、音声情報に関しても処理や編集を行なうための専用回路を設けてもよい。

【０１８４】従って、本画像形成装置は、テレビジョン放送の表示機器、テレビ会議の端末機器、静止画像及び動画像を扱う画像編集機器、コンピュータの端末機器、ワードプロセッサを初めとする事務用端末機器、ゲーム機などの機能を一台で兼ね備えることが可能で、産業用あるいは民生用として極めて応用範囲が広い。

【０１８５】尚、図１４は、表面伝導型電子放出素子を電子ビーム源とする表示パネルを用いた画像形成装置とする場合の構成の一例を示したに過ぎず、本発明の画像形成装置がこれのみに限定されるものでないことは言うまでもない。

【０１８６】例えば図１４の構成要素の内、使用目的上必要のない機能に関わる回路は省いても差し支えない。また、これとは逆に、使用目的によっては更に構成要素を追加してもよい。例えば、本表示装置をテレビ電話機として応用する場合には、テレビカメラ、音声マイク、照明機、モデムを含む送受信回路等を構成要素に追加するのが好適である。

【０１８７】本画像形成装置においては、とりわけ表面伝導型電子放出素子を電子源としているので、ディスプレイパネルの薄形化が容易であり、画像形成装置の奥行きを小さくすることができる。それに加えて、表面伝導型電子放出素子を電子ビーム源とする表示パネルは大画面化が容易で輝度が高く視野角特性にも優れるため、画像形成装置は臨場感にあふれ、迫力に富んだ画像を視認性良く表示することが可能である。

【０１８８】

【発明の効果】以上説明したように、本発明によれば、電子放出素子の電子放出用膜となる導電性膜に圧電体を付設し、該圧電体に電圧を印加することにより生ずる逆圧電効果を利用して、導電性膜に機械的な歪みを発生させ、この歪みを利用して導電性膜に電子放出部を形成する。また、上記逆圧電効果による導電性膜の機械的な歪みの発生は、従来のフォーミング処理時の導電性膜の局

適宜制御することができるので、電子放出部の形状をある程度制御することも可能であり、これにより特性の揃った電子放出素子を多数配置することができる。

【０１９０】以上のことから、輝度のバラツキの小さいより信頼性の高い電子源及び画像形成装置を得ることができる。

【図面の簡単な説明】

【図１】本発明の電子放出素子の一例である表面伝導型電子放出素子の一例を模式的に示した平面図及び縦断面図である。

【図２】本発明の電子放出素子の一例である表面伝導型電子放出素子の他の例を模式的に示した縦断面図である。

【図３】図１の表面伝導型電子放出素子の製造方法を説明するための図である。

【図４】図２の表面伝導型電子放出素子の製造方法を説明するための図である。

【図５】フォーミング波形の例を示す図である。

【図６】本発明の表面伝導型電子放出素子の測定評価系の一例を示す概略的構成図である。

【図７】本発明の表面伝導型電子放出素子の放出電流－素子電圧特性（Ｉ－Ｖ特性）を示す図である。

【図８】単純マトリクス配置の本発明の電子源の概略的構成図である。

【図９】単純マトリクス配置の電子源を用いた本発明の画像形成装置に用いる表示パネルの概略的構成図である

【図１０】図９の表示パネルにおける蛍光膜を示す図である。

【図１１】図９の表示パネルを駆動する駆動回路の一例を示す図である。

【図１２】梯型配置の本発明の電子源の概略的平面図である。

【図１３】梯型配置の電子源を用いた本発明の画像形成装置に用いる表示パネルの概略的構成図である。

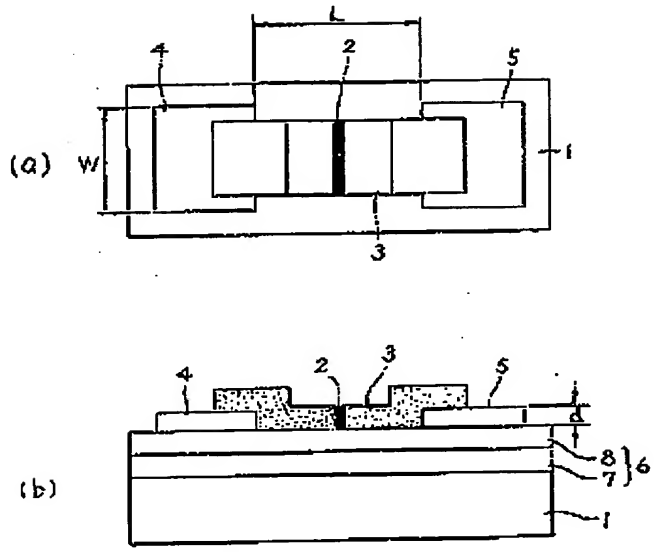
【図１４】本発明の実施例に係る画像形成装置を示すブロック図である。

【符号の説明】

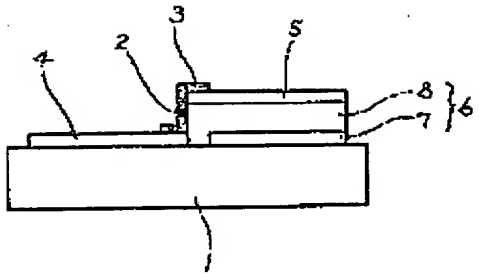
１　基板
２　電子放出部
３　導電性膜
４、５　素子電極
６　圧電体

５１　電源
５２　放出電流Ｉｅを測定するための電流計
５３　高圧電源
５４　アノード電極
５５　真空装置
５６　排気ポンプ
１０２　Ｘ方向配線
１０３　Ｙ方向配線
１０４　表面伝導型電子放出素子
１０５　結線
１１１　リアプレート
１１２　支持枠
１１３　ガラス基板
１１４　蛍光膜
１１５　メタルバック
１１６　フェースプレート
１１８　外囲器
１２１　黒色導伝材
１２２　蛍光体
２０１　表示パネル
２０２　走査回路
２０３　制御回路
２０４　シフトレジスタ
２０５　ラインメモリ
２０６　同期信号分離回路
２０７　変調信号発生器
３０１　表示パネル
３０２　グリッド電極
３０３　開口
３０４　共通配線
１００１　駆動回路
１００２　ディスプレイコントローラ
１００３　マルチプレクサ
１００４　デコーダ
１００５　入出力インターフェース回路
１００６　ＣＰＵ
１００７　画像生成回路
１００８　画像メモリーインターフェース回路
１００９　画像メモリーインターフェース回路
１０１０　画像メモリーインターフェース回路
１０１１　画像入力インターフェース回路
１０１２　ＴＶ信号受信回路

【図１】


(a)
W
L
4
2
5
1
3
(b)
4
2
3
5
δ
8
7
6
1

【図２】


3
2
5
4
8
7
6
1

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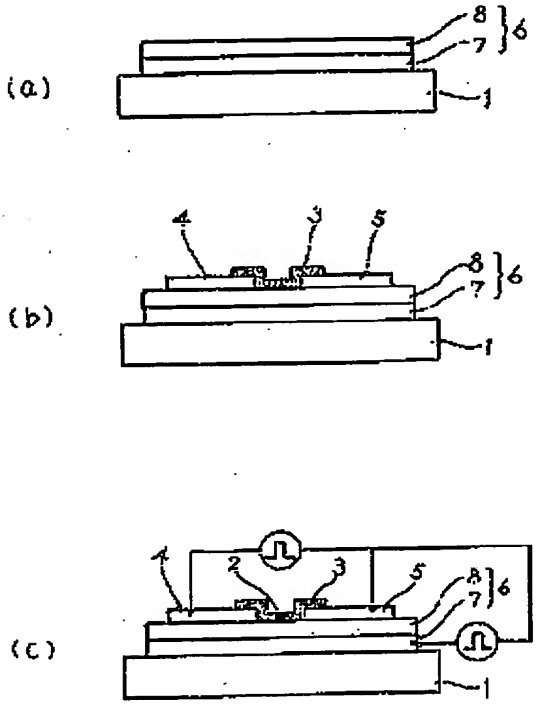
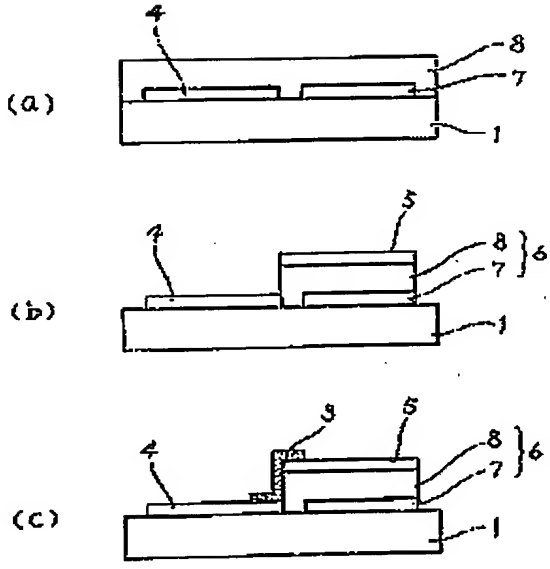

(a)
8
7
6
1
(b)
4
3
5
8
7
6
1
(c)
4
2
3
5
8
7
6
1

【図４】


(a)
4
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7
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(b)
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8
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1
(c)
4
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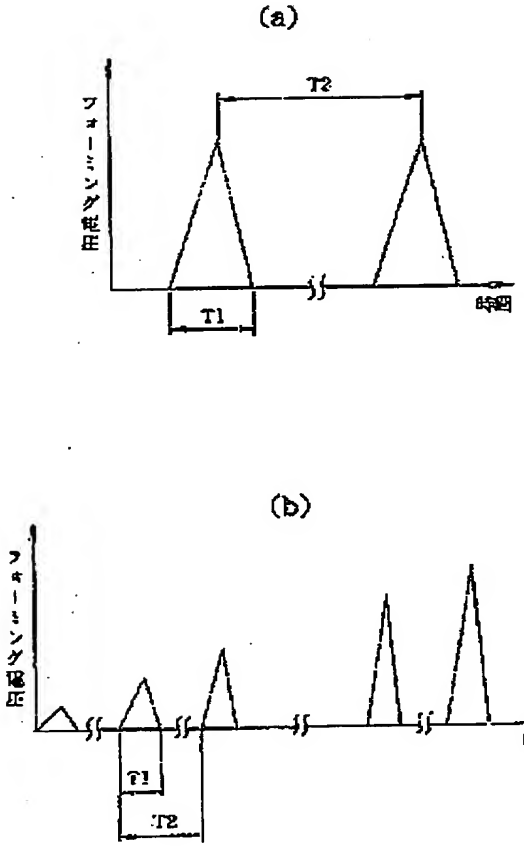
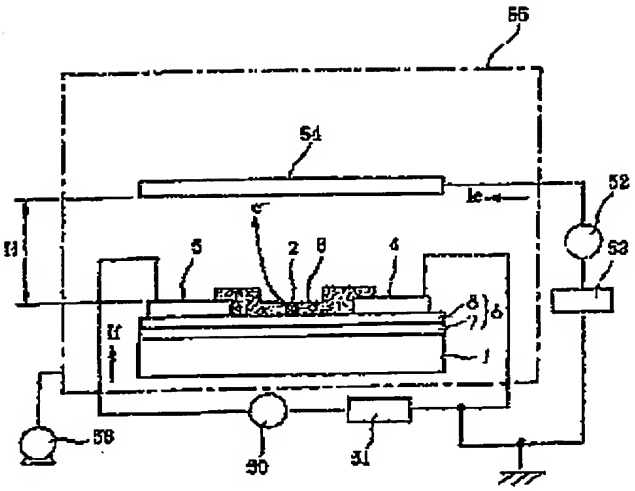
7
6
1

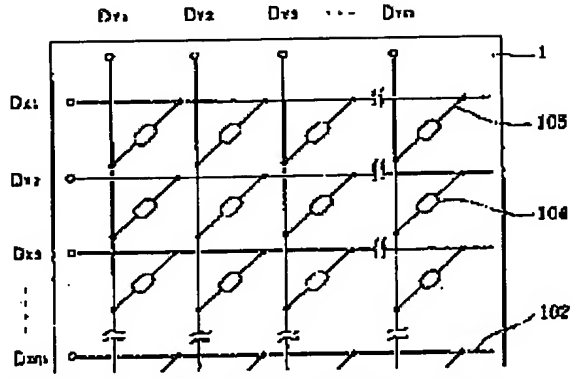
【図５】


(a)
T2
T1
時間
(b)
T1
T2
時間

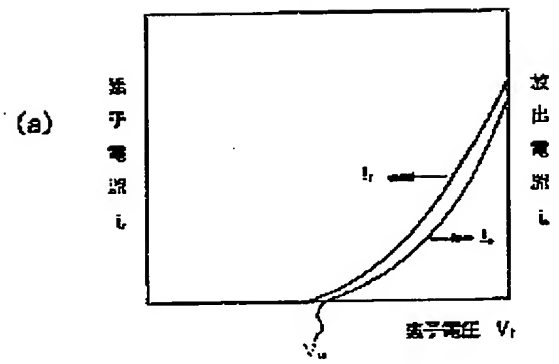
【図６】


55
54
52
53
5
2
8
4
1
58
30
31

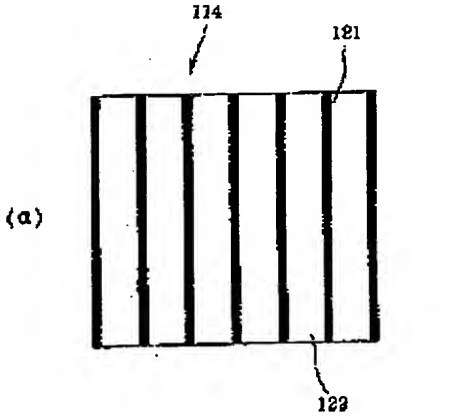
【図８】


Dx1
Dx2
Dx3
Dxm
1
105
104
102

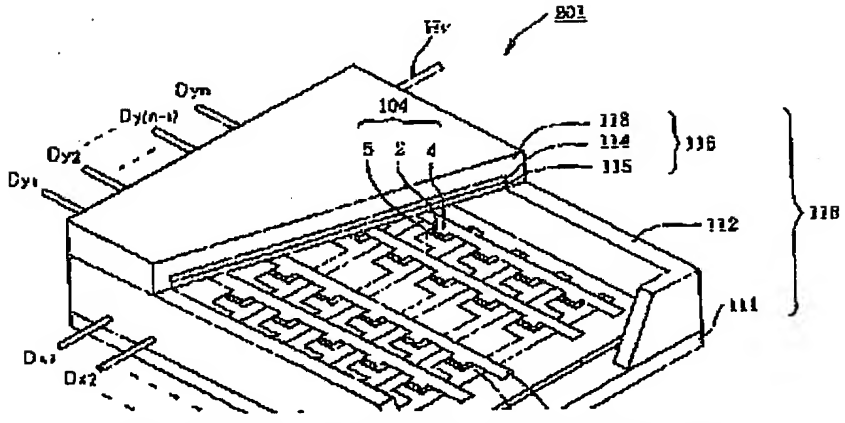
【図7】


(a)
放出電流 i_e
I_r
I_e
V_{th}
(b)
検知電流 i_r
検知電圧 V_r

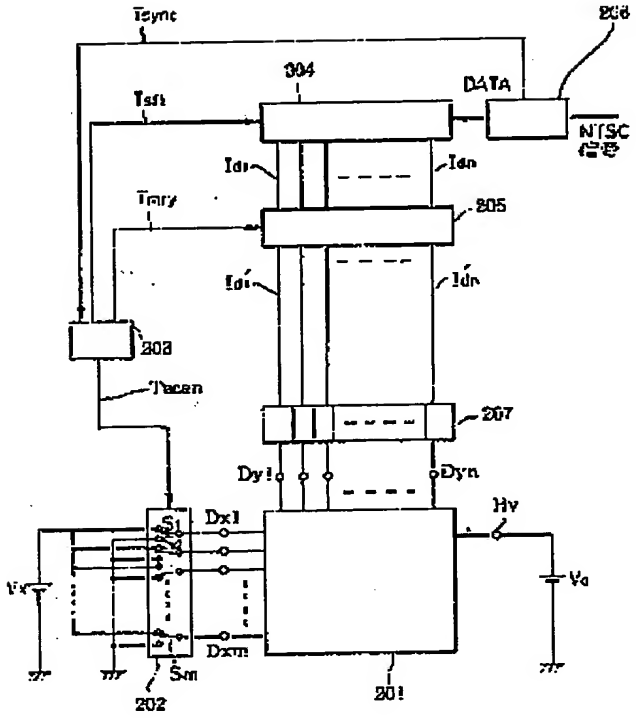
【図10】


114
121
(a)
122
114
121
(b)
122

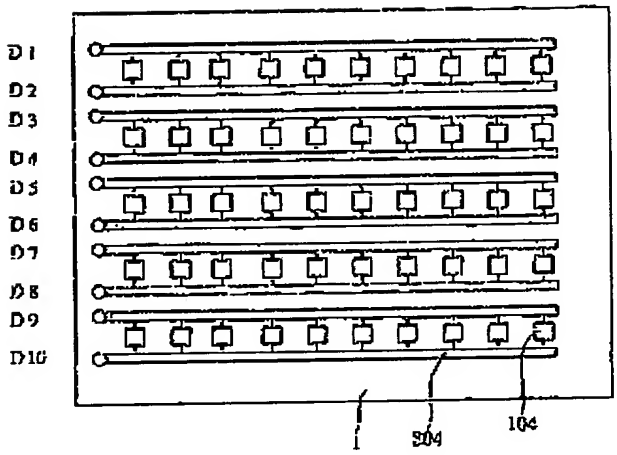
【図9】


801
Hv
Dym
Dy(n-1)
Dy2
Dy1
104
5
2
4
118
114
115
116
112
111
118
Dx1
Dx2

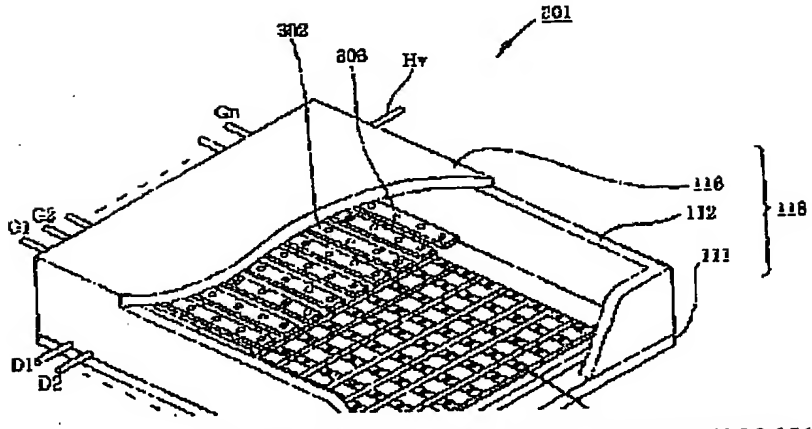
【図11】


Tsync
206
304
DATA
Tsft
NTSC
Tmry
205
203
Tscan
207
Dy1
Dyn
Hv
Dx1
Vs
Va
Dxm
Sm
202
201

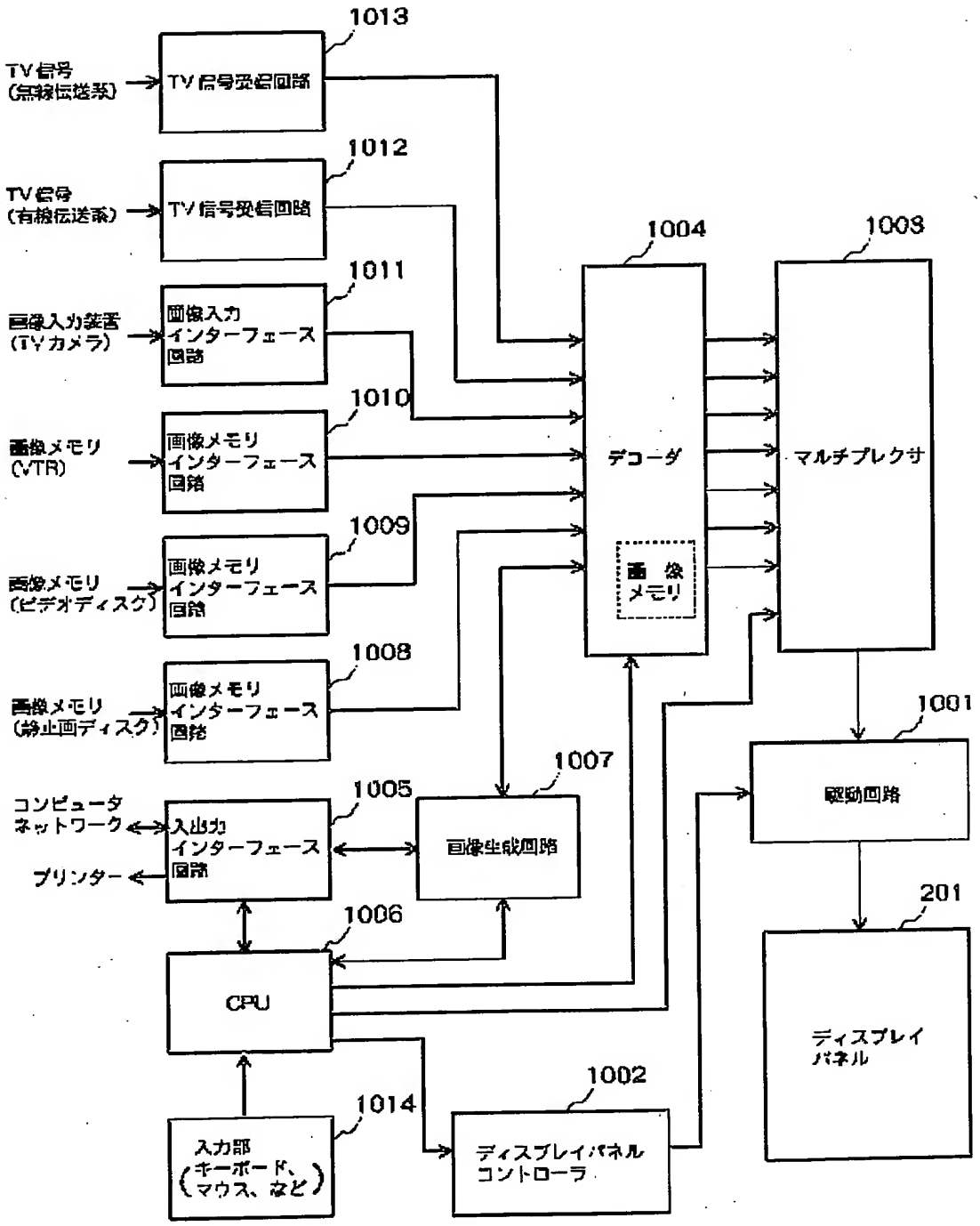
【図12】


D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
1
104

【図13】


201
302
303
Hv
Gn
G1
G2
116
112
111
118
D1
D2

【図１４】


1013
TV信号
(無線伝送系)
TV信号受信回路
1012
TV信号
(有線伝送系)
TV信号受信回路
1004
1003
1011
画像入力装置
(TVカメラ)
画像入力
インターフェース
回路
1010
画像メモリ
(VTR)
画像メモリ
インターフェース
回路
デコーダ
画像
メモリ
マルチプレクサ
1009
画像メモリ
(ビデオディスク)
画像メモリ
インターフェース
回路
1008
画像メモリ
(静止画ディスク)
画像メモリ
インターフェース
回路
1001
1007
1005
コンピュータ
ネットワーク
プリンター
入出力
インターフェース
回路
画像生成回路
駆動回路
201
1006
CPU
ディスプレイ
パネル
1002
1014
入力部
(キーボード、
マウス、など)
ディスプレイパネル
コントローラ

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

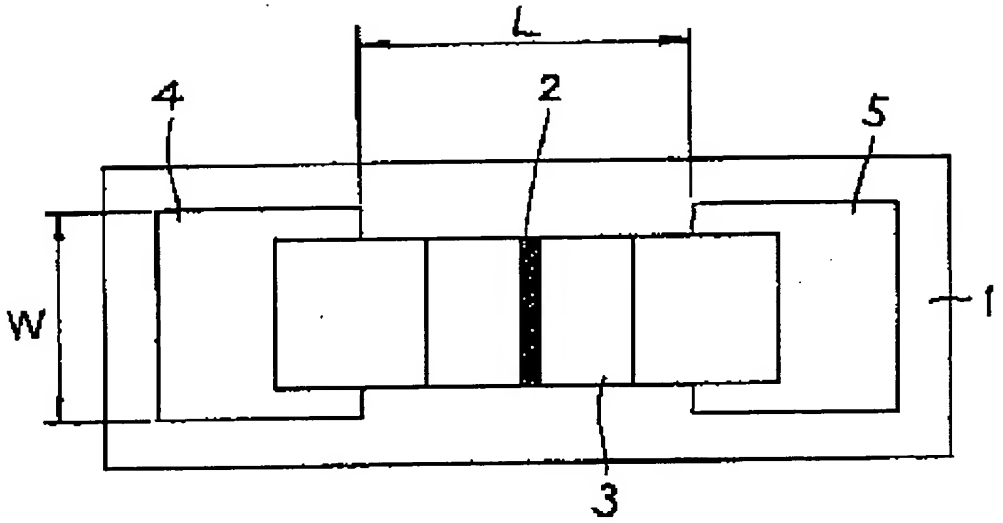
[Claim(s)]
[Claim 1] The manufacture approach of the electron emission component characterized by having the process which forms the electron emission section at this conductive film according to the inverse piezolectric effect to the conductive film in the manufacture approach of the electron emission component which equips inter-electrode with the conductive film which has the electron emission section.
[Claim 2] Furthermore, the manufacture approach of the electron emission component according to claim 1 characterized by having the process which forms the electron emission section in this conductive film by energization processing to said conductive film.
[Claim 3] The manufacture approach of the electron emission component characterized by having the process which impresses an electrical potential difference to the piezo electric crystal attached to the conductive film in the manufacture approach of the electron emission component which equips inter-electrode with the conductive film which has the electron emission section.
[Claim 4] Furthermore, the manufacture approach of the electron emission component according to claim 3 characterized by having the process which performs energization processing on said conductive film.
[Claim 5] Said electron emission component is the manufacture approach of the electron emission component according to claim 1 to 4 characterized by being a surface conduction mold electron emission component.
[Claim 6] The electron emission component characterized by being obtained by the manufacture approach according to claim 1 to 5.
[Claim 7] The manufacture approach of an electron source that said electron emission component is characterized by being manufactured by the approach according to claim 1 to 5 in the manufacture approach of an electron source of having the driving means of an electron emission component and this electron emission component.
[Claim 8] Said electron source is the manufacture approach of an electron source according to claim 7 that two or more electron emission components are the electron sources which have at least one or more trains of element arrays by which connection was carried out to juxtaposition.
[Claim 9] Said electron source is the manufacture approach of an electron source according to claim 7 that two or more trains of the element array with which connection of two or more electron emission components was carried out to juxtaposition are the electron sources by which matrix arrangement is carried out.
[Claim 10] The electron source characterized by being obtained by the manufacture approach according to claim 7 to 9.

[Claim 11] The manufacture approach of the panel for image formation that said electron emission component is characterized by being manufactured by the approach according to claim 1 to 5 in the manufacture approach of the panel for image formation of having an electron emission component and the image formation member which forms an image by the exposure of an electron ray.
[Claim 12] Said panel for image formation is the manufacture approach of the panel for image formation according to claim 11 that two or more electron emission components are the panels for image formation which have at least one or more trains of element arrays by which connection was carried out to juxtaposition.
[Claim 13] Said panel for image formation is the manufacture approach of the panel for image formation according to claim 11 which is a panel for image formation by which matrix arrangement of two or more trains of the element array with which connection of two or more electron emission components was carried out to juxtaposition is carried out.
[Claim 14] The manufacture approach of the panel for image formation according to claim 11 to 13 that said image formation member is a fluorescent substance.
[Claim 15] The panel for image formation characterized by being obtained by the manufacture approach according to

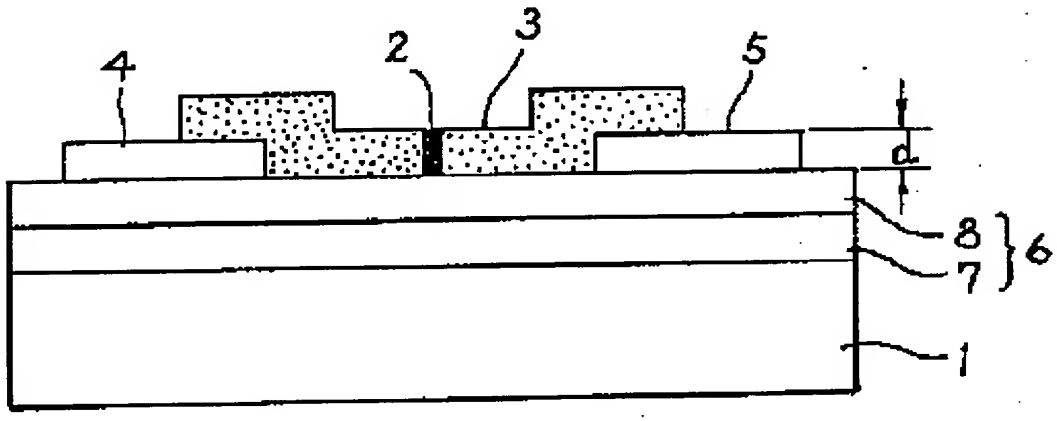
claim 11 to 14.
[Claim 16] The manufacture approach of image formation equipment that said electron emission component is characterized by being manufactured by the approach according to claim 1 to 5 in the manufacture approach of image formation equipment of having the driving means which controls the exposure to an electron emission component, an image formation member, and said image formation member of the electron ray emitted from said electron emission component according to an information signal.
[Claim 17] Said image formation equipment is the manufacture approach of image formation equipment according to claim 16 that two or more electron emission components are image formation equipment which has at least one or more trains of element arrays by which connection was carried out to juxtaposition.
[Claim 18] Said image formation equipment is the manufacture approach of the image formation equipment according to claim 16 which is image formation equipment with which matrix arrangement of two or more trains of the element array with which connection of two or more electron emission components was carried out to juxtaposition is carried out.
[Claim 19] The manufacture approach of image formation equipment according to claim 16 to 18 that said image formation member is a fluorescent substance.
[Claim 20] Image formation equipment characterized by being obtained by the manufacture approach according to claim 16 to 19.

[Translation done.]

(a)



(b)



DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to image formation equipments constituted using the electron source which comes to arrange a majority of electron emission components and these electron emission components, and this electron source, such as a display and an aligner.
[0002]
[Description of the Prior Art] Conventionally, it divides roughly into an electron emission component, and two kinds, a thermionic emission component and a cold cathode electron emission component, are known. There are a field emission mold ("FE mold" is called hereafter.), a metal / insulating layer / metal mold (an "MIM mold" is called hereafter.), a surface conduction mold electron emission component, etc. as cold cathode electron emission component.
[0003] As an example of FE mold W. P. Dyke and W.W. Dolan and "Field Emission", Advance in Electron Physics 8, 89 (1956), or C.A. Spindt, "Physical Properties of thin-film field emission cathodes with molybdenum cones" J. Appl. What was indicated by Phys., 47, 5248 (1976), etc. is known.
[0004] As an example of an MIM mold, it is C.A. Mead, "Operation ofTunnel-Emission Devices", J. Appl. Phys. What was indicated by 32,646 (1961) etc. is known.
[0005] As an example of a surface conduction mold electron emission component, it is M.I. Elinson Radio Eng. Electron Phys. There are some which were indicated by 10, 1290 (1965), etc.
[0006] A surface conduction mold electron emission component uses the phenomenon which electron emission produces by passing a current at parallel at a film surface in the thin film of the small area formed on the insulating substrate. As this surface conduction mold electron emission component, it is SnO2 by said Elinson etc. The thing using a thin film, Thing [G. by Au thin film Dittmer: "Thin Solid Films", 9,317(1972)], In 2O3 / SnO2 Thing [M. by the thin film Hartwell and C.G. Fonstad: "IEEE Trans. ED Conf.", 519(1975)], Others [/ by the carbon thin film / thing [Araki **]: A vacuum, the 26th volume, No. 1, 22-page (1983)], etc. are reported.
[0007] A surface conduction mold electron emission component uses the phenomenon which electron emission produces by passing a current at parallel at a film surface on the conductive film formed on the insulating substrate.
[0008] What formed the electron emission section by energization processing beforehand called foaming is mentioned to conductive film, such as a metallic oxide which connects the component inter-electrode of the couple prepared on the insulating substrate as a typical example of a configuration of a surface conduction mold electron emission component. foaming is usually performed to the ends of the conductive film by carrying out impression energization of direct current voltage or the rising voltage carried out very slowly, for example, 1V / rising voltage for about 1 minute, breaks, deforms or deteriorates the conductive film locally, and changes structure -- making -- electric -- high -- it is the processing which forms the electron emission section of a condition [****]. Electron emission is performed from near the crack generated in the electron emission section by impressing an electrical potential difference to the conductive film with which the above-mentioned electron emission section was formed, and passing a current.
[0009] Since structure is simple and manufacture is also easy structure, the above-mentioned surface conduction mold electron emission component covers a large area, and has the advantage which can carry out a large number array formation. Then, the various application for harnessing this description is studied. For example, utilization to image formation equipments, such as a display, is mentioned.
[0010] Conventionally, as an example which carried out array formation of many surface conduction mold electron emission components, a surface conduction mold electron emission component is arranged to juxtaposition, and the electron source which carried out the line array (it is also called ladder type arrangement) of many lines which connected the ends (both components electrode) of each surface conduction mold electron emission component with

wiring (it is also called common wiring), respectively is mentioned (JP,64-31332,A, a 1-283749 official report, 2-257552 official report). Moreover, especially in the display, the display which combined the electron source to which it was possible to have considered as the display using liquid crystal and the same plate mold display, and the back light has moreover arranged many surface conduction mold electron emission components as an unnecessary spontaneous light type display, and the fluorescent substance which emits light in the light by the exposure of the electron ray from this electron source is proposed (the U.S. patent No. 5066883 description).

[0011]

[Problem(s) to be Solved by the Invention] However, in said conventional surface conduction mold electron emission component, the heat generated in the case of the foaming processing by energization had various effects on the component configuration member, and had also produced the effect on the electron emission characteristic as a result.

[0012] This invention tends to prevent the effect on the component by generation of heat at the time of the above-mentioned foaming processing, aims at reduction of generation of heat at the time of the above-mentioned foaming processing, reduces the effect on the component configuration member and the electron emission characteristic by this generation of heat, and aims at a more reliable electron emission component and a more reliable electron source, and providing the panel list for image formation using this further with image formation equipment.

[0013]

[Means for Solving the Problem] The configuration of this invention accomplished that the above-mentioned object should be attained is as follows.

[0014] That is, in the manufacture approach of the electron emission component which equips inter-electrode with the conductive film which has the electron emission section, it is in the manufacture approach of the electron emission component characterized by having the process which forms the electron emission section at this conductive film according to the inverse piezolectric effect to the conductive film the first of this invention.

[0015] The above-mentioned this invention first, what "it has for the process which forms the electron emission section in this conductive film by energization processing to said conductive film" is further included as the description.

[0016] Moreover, the second is in the manufacture approach of the electron emission component characterized by having the process which impresses an electrical potential difference to the piezo electric crystal attached to the conductive film in the manufacture approach of the electron emission component which equips inter-electrode [of this invention] with the conductive film which has the electron emission section.

[0017] Above-mentioned this invention second contains further what "it has the process which performs energization processing on said conductive film for" as the description.

[0018] Moreover, the third of this invention has said electron emission component in the manufacture approach of the electron source characterized by being manufactured by said this invention first or second approach in the manufacture approach of an electron source of having the driving means of an electron emission component and this electron emission component.

[0019] Above-mentioned this invention third also contains further what "said electron source is an electron source which has at least one or more trains of element arrays with which connection of two or more electron emission components was carried out to juxtaposition", and the thing "which said electron source is also an electron source by which matrix arrangement of two or more trains of the element array with which connection of two or more electron emission components was carried out to juxtaposition is carried out" as the description.

[0020] Moreover, the fourth of this invention has said electron emission component in the manufacture approach of the panel for image formation characterized by being manufactured by said this invention first or second approach in the manufacture approach of the panel for image formation of having an electron emission component and the image formation member which forms an image by the exposure of an electron ray.

[0021] above-mentioned this invention fourth -- further -- as the description -- "-- said panel for image formation What [two or more electron emission components are the panels for image formation which have at least one or more trains of element arrays by which connection was carried out to juxtaposition"] "said panel for image formation What two or more trains of the element array with which connection of two or more electron emission components was carried out to juxtaposition are the panels for image formation by which matrix arrangement is carried out", and the thing "which said image formation member is also a fluorescent substance" are also included.

[0022] Moreover, the fifth of this invention has said electron emission component in the manufacture approach of the image formation equipment characterized by being manufactured by said this invention first or second approach in the manufacture approach of image formation equipment of having the driving means which controls the exposure to an electron emission component, an image formation member, and said image formation member of the electron ray emitted from said electron emission component according to an information signal.

[0023] Above-mentioned this invention fifth also contains further what "said image-formation equipment is image-formation equipment which has at least one or more trains of element arrays with which connection of two or more electron-emission components was carried out to juxtaposition", the thing "which said image-formation equipment is image-formation equipment with which matrix arrangement of two or more trains of the element array with which connection of two or more electron-emission components was carried out to juxtaposition is carried out", and the thing "which said image-formation member is also a fluorescent substance" as the description.
[0024] Furthermore, this invention relates to the electron emission component obtained by the above-mentioned this invention first - the fifth process, an electron source, the panel for image formation, and image formation equipment.
[0025]
[Embodiment of the Invention] As mentioned above, this invention relates to the new electron source equipped with two or more new electron emission components and these electron emission components, the new panel for image formation using this, and image formation equipment, and explains the configuration and operation of each invention further below.
[0026] An example of the electron emission component concerning this invention is shown in drawing 1 . The electron emission component shown in drawing 1 is a surface conduction mold electron emission component of a flat-surface mold, and, as for one in drawing, as for a substrate and 2, the electron emission section and 3 are piezo electric crystals with which the conductive film, and 4 and 5 consist of component electrodes, and 6 consists of a piezo electric crystal electrode 7 and a piezo electric crystal layer 4.
[0027] As a substrate 1, it is SiO2 by a spatter etc. to the glass which decreased impurity contents, such as quartz glass and Na, for example, blue plate glass, and blue plate glass. Ceramics which carried out the laminating, such as a layered product and an alumina, is mentioned.
[0028] As an ingredient of the component electrodes 4 and 5 which counter, and the piezo electric crystal electrode 7 Common conductor material is used. For example, nickel, Cr, Au, Mo, W, Pt, Metals, such as Ti, aluminum, Cu, and Pd, or an alloy, and Pd, Ag, Au, the printed conductor which consists of a metal or a metallic oxide, glass, etc., such as RuO2 and Pd-Ag, and In2 O3-SnO2 etc. -- it is suitably chosen from semi-conductor conductor material, such as a transparence conductor and polish recon, etc.
[0029] As an ingredient of the piezo electric crystal layer 8, ZnO, AlN, PbTiO3, BaTiO3, PZT, etc. are used, and the thickness has about 3 micrometers desirable at about 10 micrometers from 500nm from 100nm.
[0030] The configuration of the component electrode spacing L, component electrode die-length W, and the conductive film 3 etc. is designed by the gestalt applied.
[0031] As for the component electrode spacing L, it is desirable that it is hundreds of micrometers from hundreds of A, and it is dozens of micrometers from several micrometers more preferably by the component electrode 4, the electrical potential difference impressed among five.
[0032] When component electrode die-length W takes into consideration the resistance and the electron emission characteristic of an electrode, it is hundreds of micrometers from several micrometers preferably, and the component electrolyte thickness d is several micrometers from hundreds of A.
[0033] In addition, although the surface conduction mold electron emission component shown in drawing 1 is that by which the laminating was carried out to the order of a piezo electric crystal 6, the component electrodes 4 and 5, and the conductive film 3 on the substrate 1, it is good on a substrate 1 also as what carried out the laminating to the order of a piezo electric crystal 6, the conductive film 3, and the component electrodes 4 and 5.
[0034] As for the conductive film 3, it is desirable that it is especially the particle film which consisted of particles in order to acquire the good electron emission characteristic, and the thickness is suitably chosen by the resistance between the step coverage to the component electrodes 4 and 5, the component electrode 4, and 5 and the energization processing conditions mentioned later, the electrical-potential-difference impression conditions to a piezo electric crystal, etc. The thickness of this conductive film 3 is thousands of A from several angstroms preferably, it is 500A from 10A especially preferably, and that resistance is sheet resistance of the 7th power ohm / ** of 10 from the cube of 10.
[0035] As an ingredient which constitutes the conductive film 3, for example Metals, such as Pd, Pt, Ru, Ag, Au, Ti, In, Cu, Cr, Fe, Zn, Sn, Ta, W, and Pb, PdO, SnO2, In 2O3, PbO, and Sb 2O3 etc. -- an oxide -- HfB2, ZrB2 and LaB6, CeB6, YB4, and GdB4 etc. -- semi-conductors, such as nitrides, such as carbide, such as boride, and TiC, ZrC, HfC, TaC, SiC, WC, and TiN, ZrN, HfN, and Si, germanium, carbon, etc. are mentioned.
[0036] In addition, the above-mentioned particle film is film with which two or more particles gathered, and not only the condition that the particle distributed separately but a particle puts mutually the film in contiguity or the condition (it contains, also when some particles gather and island-like structure is formed as a whole) of having overlapped, as

the fine structure. When it is the particle film, it is desirable especially desirable that it is thousands of A from several angstroms, and the particle size of a particle is 200A from 10A.
[0037] The crack is included in the electron emission section 2, and electron emission is performed from near [this] a crack. The electron emission section 2 and the crack itself including this crack are formed depending on processes, such as thickness of the conductive film 3, membraneous quality, an ingredient and energization processing conditions mentioned later, and electrical-potential-difference impression conditions to a piezo electric crystal. Therefore, the location and configuration of the electron emission section 2 are not specified as a location and a configuration as shown in drawing 1 .
[0038] Inside a crack, it may have a conductive particle with a particle size of several angstroms to hundreds of A. This conductive particle is the same as that of some elements of the ingredient which constitutes the conductive film 3, or all. Moreover, the electron emission section 2 including a crack and the conductive film 3 of the near may have carbon and a carbon compound.
[0039] Next, the fundamental configuration of the electron emission component of a vertical type is explained.
[0040] Drawing 2 is drawing showing the fundamental configuration of the surface conduction mold electron emission component of a vertical type, and the same sign as drawing 1 shows the same member.
[0041] A substrate 1, the electron emission section 2, the conductive film 3, the component electrodes 4 and 5, and a piezo electric crystal 6 consist of the same ingredients as the electron emission component of the flat-surface mold mentioned above, and are produced by the same approach as the above-mentioned except for the point of forming the conductive film 3 between the component electrode 4 and 5 [the side face of a piezo electric crystal 6, and] etc.
[0042] It corresponds to the component electrode spacing L of the electron emission component of the flat-surface mold described previously (refer to drawing 1), and preferably, from hundreds of A, the thickness of a piezo electric crystal 6 is dozens of micrometers, and is several micrometers from hundreds of A especially preferably.
[0043] Moreover, since it depends for formation of the electron emission section 2 on processes, such as thickness of the conductive film 3, membraneous quality, an ingredient and foaming conditions mentioned later, and electrical-potential-difference impression conditions to a piezo electric crystal, as explanation of the electron emission component of a flat-surface mold was described, the location and configuration are not specified as a location and a configuration as shown in drawing 2 .
[0044] In addition, although a flat-surface mold is made into an example and the following explanation explains it among the electron emission component of an above-mentioned flat-surface mold, and the electron emission component of a vertical type, it is replaced with the electron emission component of a flat-surface mold, and is good also as an electron emission component of a vertical type.
[0045] Although various approaches as a process of a surface conduction mold electron emission component as shown in drawing 1 can be considered, the example is explained based on drawing 3 . In addition, in drawing 3 , the same sign as drawing 1 shows the same member.
[0046] 1) Form a piezo electric crystal 6 on a substrate 1. For example, the piezo electric crystal electrode 7 is formed on the field of this substrate 1 with a photolithography technique etc. after depositing a piezo electric crystal electrode material by the vacuum deposition method, a spatter, etc., and the piezo electric crystal layer 8 is further formed in a substrate 1 with a spatter or a spray method (drawing 3 (a)).
[0047] 2) Next, form the component electrodes 4 and 5 on the field of a substrate 1 with a photolithography technique etc. after making a component electrode material deposit by the vacuum deposition method, a spatter, etc. on a piezo electric crystal 6. Then, by applying and leaving an organic metal solution on the substrate 1 which formed the component electrodes 4 and 5, between the component electrode 4 and the component electrode 5 is connected, and an organic metal thin film is formed. In addition, an organic metal solution is a solution of the organic compound which uses the metal of the component of the above-mentioned conductive film 3 as the main element. Then, the conductive film 3 in which carried out heating baking processing of the organic metal thin film, and patterning was carried out by a lift off, etching, etc. is formed (drawing 3 (b)).
[0048] In addition, although explained by the method of applying an organic metal solution, the organic metal film can also be formed here, for example by vacuum evaporation technique, a spatter, modified chemical vapor deposition, the distributed applying method, the dipping method, the spinner method, etc., without restricting to this.
[0049] 3) Then, give a foaming process.
[0050] While energizing between the component electrode 4 and 5, by impressing an electrical potential difference to the piezo electric crystal electrode 7 of a piezo electric crystal 6, the conductive film 3 is made to break, deform or deteriorate locally, and the electron emission section 2 from which structure changed is formed (drawing 3 (c)). That is, the conductive film 3 attached to this piezo electric crystal 6 is made to generate a mechanical distortion using the

inverse piezolectric effect produced by impressing an electrical potential difference to a piezo electric crystal 6, and the electron emission section 2 is formed in this conductive film 3 by this distortion.
[0051] Thus, in this invention, by promoting the local destruction, deformation, or deterioration of the conductive film at the time of the same energization foaming as usual, the calorific value at the time of energization foaming is reduced, and the effect on the component configuration member and the electron emission characteristic by this generation of heat can be reduced according to making the conductive film 3 generate a mechanical distortion according to an inverse piezolectric effect.
[0052] In addition, since the magnitude of the above-mentioned distortion is controllable by the electrical potential difference impressed to the piezo electric crystal ingredient to be used or a piezo electric crystal suitably, control of the configuration of the electron emission section 2 is also possible for it.
[0053] The example of the voltage waveform impressed between the component electrode 4 in the above-mentioned energization foaming and 5 is shown in drawing 5 .
[0054] Especially a voltage waveform has a desirable pulse shape, and it may impress an electrical-potential-difference pulse, making the case (drawing 5 (a)) where the electrical-potential-difference pulse which made the pulse height value the constant voltage is impressed continuously, and a pulse height value increase (drawing 5 (b)).
[0055] First, drawing 5 (a) explains the case where a pulse height value is made into a constant voltage.
[0056] It is the pulse width and pulse separation of a voltage waveform, for example, T1 is made into 1 microsecond - 10 mses, they make T2 10 microseconds - 100 mses, and T1 and T2 in drawing 5 (a) choose it suitably according to the gestalt of the electron emission component which mentioned above peak value (peak voltage at the time of foaming), and they are impressed from several seconds for dozens minutes under the vacuum ambient atmosphere of a degree of vacuum with suitable - 5th power torr extent of 10. In addition, the voltage waveform to impress is not limited to the chopping sea illustrated, and the wave of requests, such as a square wave, may be used for it, and it cannot restrict it to an above-mentioned value about the peak value, and pulse width, pulse separation, etc., and it can choose a desired value according to the resistance of an electron emission component etc. so that the electron emission section 2 may be formed good.
[0057] Next, drawing 5 (b) explains the case where an electrical-potential-difference pulse is impressed, making a pulse height value increase.
[0058] T1 and T2 in drawing 5 (b) -- drawing 5 (a) -- the same -- peak value (peak voltage at the time of foaming) -- for example, it is made to increase 0.1V step extent every, and impresses under the same suitable vacuum ambient atmosphere as explanation of drawing 5 (a).
[0059] In addition, it is desirable to end foaming, when a component current is measured on the electrical potential difference of extent which the conductive film 3 breaks and deforms or does not deteriorate it locally, for example, an about [0.1V] electrical potential difference, and resistance is calculated, for example, resistance beyond 1M ohm is shown in pulse separation T2.
[0060] The process after it can be performed within a measurement assessment system as shown in drawing 6 from the above-mentioned foaming process. This measurement assessment system is explained.
[0061] In drawing 6 , the same sign as drawing 1 shows the same member. Moreover, an ammeter for a power source for 51 to impress the component electrical potential difference Vf to a component and 50 to measure the component current If which flows the component electrode 4 and the conductive film 3 between five, As for an ammeter for a high voltage power supply for an anode electrode for 54 to catch the emission current Ie emitted from the electron emission section 2 and 53 to impress an electrical potential difference to the anode electrode 54 and 52 to measure the emission current Ie emitted from the electron emission section 2, and 55, vacuum devices and 56 are exhaust air pumps.
[0062] An electron emission component and anode electrode 54 grade are installed in vacuum devices 55, the device which needs a non-illustrated vacuum gage etc. for these vacuum devices 55 possesses them, and measurement assessment of an electron emission component has come to be able to do them under a desired vacuum.
[0063] The exhaust air pump 56 consists of a usual high vacuum equipment system which consists of a turbine pump, a rotary pump, etc., and an ultra-high-vacuum equipment system which consists of an ion pump etc. Moreover, the substrate 1 of the vacuum-devices 55 whole and an electron emission component can be heated now to about 200 degrees C at a heater. In addition, in the assembly phase of a display panel which is mentioned later, this measurement assessment system is constituting a display panel and its interior as vacuum devices 55 and its interior, and is applied to the measurement assessment and processing in a foaming process and the process after it mentioned later.
[0064] 4) It is desirable to give an activation process furthermore.
[0065] An activation process is a process which can raise the condition of a component current and the emission current remarkably by making carbon and a carbon compound deposit on the electron emission section 2 from the

organic substance which says the thing of the processing which repeats impression of the pulse which is the degree of vacuum of for example , torr extent , and made the pulse height value the constant voltage the 10 to 4th power to the 10 to 5th power , and exists in a vacuum ambient atmosphere . Since this activation process is effective if it is made to end when it carries out, measuring for example, a component current and the emission current, for example, the emission current is saturated, it is desirable. Moreover, the pulse height value in an activation process is the peak value of driver voltage preferably.

[0066] In addition, the above-mentioned carbon and a carbon compound are graphite (the both sides of a single crystal and polycrystal are pointed out), and amorphous carbon (the mixture of amorphous carbon, and this and polycrystal graphite is pointed out). Moreover, 500A or less of the deposition thickness is 300A or less more preferably.

[0067] 5) It is desirable to give the stabilization process which carries out actuation of the electron emission component which carried out in this way and was produced of operation under the vacuum ambient atmosphere of a degree of vacuum higher than the degree of vacuum in a foaming process and an activation process. Actuation of operation is more preferably carried out after 80-150-degree C heating under the vacuum ambient atmosphere of this high degree of vacuum.

[0068] In addition, the vacuum ambient atmosphere of a degree of vacuum higher than the degree of vacuum of a foaming process and an activation process is a vacuum ambient atmosphere which has a degree of vacuum for example, more than about 10 6th [-] power torr, is an ultra-high-vacuum system more preferably, and is a degree of vacuum which carbon and a carbon compound do not newly deposit mostly. That is, by enclosing an electron emission component into the above-mentioned vacuum ambient atmosphere, it becomes possible to control deposition of the carbon beyond this, and a carbon compound, and the component current If and the emission current Ie are stabilized by this.

[0069] The basic property of the surface conduction mold electron emission component produced by the above component configurations and the manufacture approach is explained below.

[0070] The basic property of the surface conduction mold electron emission component described below sets the electrical potential difference of the anode electrode 54 of the measurement assessment system of drawing 6 to 1kV - 10kV, sets distance H of the anode electrode 54 and a surface conduction mold electron emission component to 2-8mm, and usually measures.

[0071] First, the typical examples of relation with the component electrical potential difference Vf are indicated to be the emission current Ie and the component current If to drawing 7 . In addition, in (a) of drawing 7 , since the emission current Ie is remarkably small compared with the component current If, it is shown per arbitration.

[0072] A surface conduction mold electron emission component has the following three characteristic properties over the emission current Ie so that clearly from (a) of drawing 7 .

[0073] First, if a surface conduction mold electron emission component impresses the component electrical potential difference Vf exceeding a certain electrical potential difference (: called as a threshold electrical potential difference Vth in (a) of drawing 7), the emission current Ie will increase rapidly and, on the other hand, the emission current Ie will hardly be detected below on the threshold electrical potential difference Vth by the 1st. That is, it is a nonlinear element with the clear threshold electrical potential difference Vth to the emission current Ie.

[0074] Since it has [2nd] the property (it is called MI property) in which the emission current Ie carries out a monotonous increment to the component electrical potential difference Vf, the emission current Ie is controllable by the component electrical potential difference Vf.

[0075] It depends for the bleedoff charge with which the anode electrode 54 (refer to drawing 6) is supplemented the 3rd on the time amount which impresses the component electrical potential difference Vf. That is, the amount of charges caught by the anode electrode 54 is controllable by the time amount which impresses the component electrical potential difference Vf.

[0076] While the emission current Ie has MI property to the component electrical potential difference Vf, the component current If may also have MI property to the component electrical potential difference Vf. The example of the property of such a surface conduction mold electron emission component is the property shown in (a) of drawing 7 . On the other hand, as shown in (b) of drawing 7 , the component current If may show voltage-controlled negative resistance characteristics (it is called a VCNR property) to the component electrical potential difference Vf. It is dependent on the process of a surface conduction mold electron emission component, the Measuring condition at the time of measurement, etc. whether which property is shown. However, the emission current Ie has MI property to the component electrical potential difference Vf also with the surface conduction mold electron emission component for which the component current If has a VCNR property to the component electrical potential difference Vf.

[0077] Because of the characteristic property of the above surface conduction mold electron emission components,

according to an input signal, the amount of emission electron can be easily controlled also by the electron source and image formation equipment which have arranged two or more components, and the application to the direction of many is possible.

[0078] Next, the electron source which has arranged two or more above-mentioned surface conduction mold electron emission components as an example of the electron source of this invention is described. First, the array method of a surface conduction mold electron emission component is explained.

[0079] As an array method of the electron emission component in the electron source of this invention, the direction wiring of Y of n is installed through a layer insulation layer after the direction wiring of X of m besides ladder type arrangement which was stated by the term of a Prior art, and the arrangement method which connected the direction wiring of X and the direction wiring of Y to the component electrode of the couple of a surface conduction mold electron emission component, respectively is held. This is henceforth called passive-matrix arrangement.

[0080] If the above-mentioned pulse-like electrical potential difference is suitably impressed to each component when passive-matrix arrangement of many surface conduction mold electron emission components is carried out according to the fundamental property of the surface conduction mold electron emission component mentioned above, according to an input signal, a surface conduction mold electron emission component is chosen, the amount of electron emission can be controlled, the surface conduction mold electron emission component according to individual will be chosen only with simple matrix wiring, and actuation will become independently possible.

[0081] Passive-matrix arrangement is further explained based on drawing 8 based on such a principle about the configuration of the electron source of this passive-matrix arrangement that is an example of the electron source of this invention.

[0082] In drawing 8 , a substrate 1 is a glass plate which was already explained, and the number and the configuration of the surface conduction mold electron emission component 104 which were arranged on this substrate 1 are suitably set up according to an application.

[0083] The direction wiring 102 of X of m is the conductive metal which has the external terminals Dx1, Dx2, ..., Dxm, and was each formed by the vacuum deposition method, print processes, a spatter, etc. on the substrate 1. Moreover, an ingredient, thickness, and wiring width of face are set up so that an electrical potential difference may be supplied to many surface conduction mold electron emission components 104 almost uniformly.

[0084] Each, it has the external terminals Dy1, Dy2, ..., Dyn, and the direction wiring 103 of Y of n is created like the direction wiring 102 of X.

[0085] A non-illustrated layer insulation layer is installed between the direction wiring 102 of X and the direction wiring 103 of Y of n of these m, it dissociates electrically, and matrix wiring is constituted. In addition, this m and n are both a forward integer.

[0086] SiO2 in which the non-illustrated layer insulation layer was formed by the vacuum deposition method, print processes, a spatter, etc. etc. -- it is -- it is formed in the whole surface or some of substrate 1 in which the direction wiring 102 of X was formed, in a desired configuration, and thickness, an ingredient, and a process are suitably set up so that the potential difference of the intersection of the direction wiring 102 of X and the direction wiring 103 of Y can be borne especially. The direction wiring 102 of X and the direction wiring 103 of Y are pulled out as an external terminal, respectively.

[0087] Furthermore, the component electrode (un-illustrating) with which the surface conduction mold electron emission component 104 counters is electrically connected by the direction wiring 102 of X of m, the direction wiring 103 of Y of n, and the connection 105 that consists of a conductive metal formed by the vacuum deposition method, print processes, a spatter, etc.

[0088] Here, even if m the direction wiring 102 of X, the direction wiring 103 of Y of n and connection 105, and the component electrode which counters have same some or all of the configuration element, you may differ, respectively and it is suitably chosen from the ingredient of the above-mentioned component electrode etc. It may be named a component electrode generically when wiring to these components electrode has a component electrode and the same ingredient. Moreover, the surface conduction mold electron emission component 104 may be formed in whichever on a substrate 1 or a non-illustrated layer insulation layer.

[0089] Moreover, although mentioned later in detail, in order to scan the line of the surface conduction mold electron emission component 104 arranged in the direction of X according to an input signal, a scan signal impression means by which it does not illustrate [which impresses a scan signal] is electrically connected to said direction wiring 102 of X.

[0090] On the other hand, in order to modulate each train of the train of the surface conduction mold electron emission component 104 arranged in the direction of Y according to an input signal, a modulating-signal generating means by which it does not illustrate [which impresses a modulating signal] is electrically connected to the direction wiring 103

of Y. Furthermore, the driver voltage impressed to each surface conduction mold electron emission component 104 is supplied as a difference electrical potential difference of the scan signal impressed to the surface conduction mold electron emission component 104 concerned, and a modulating signal.
[0091] Next, an example of the image formation equipment of this invention using the electron source of this invention of the above passive-matrix arrangement is explained using drawing 9 - drawing 11 . In addition, drawing 10 is drawing showing a fluorescent screen 114, drawing 9 is the basic block diagram of a display panel 201, and it is [drawing 11 is the display panel 201 of drawing 9 , and] the block diagram showing an example of the actuation circuit for performing a television display according to the TV signal of NTSC system.
[0092] The substrate of an electron source with which 1 has arranged the surface conduction mold electron emission component as mentioned above in drawing 9 , The rear plate with which 111 fixed the substrate 1, the face plate with which, as for 116, the fluorescent screen 114 and the metal back 115 grade were formed in the inner surface of a glass substrate 113, It is a housing, and 112 applies frit glass etc. to the rear plate 111, a housing 112, and a face plate 116, out of atmospheric air or nitrogen, it is sealed by calcinating 10 minutes or more at 400-500 degrees C, and constitutes the envelope 118.
[0093] In drawing 9 , 102 and 103 are the direction wiring of X and the direction wiring of Y which were connected with the component electrodes 4 and 5 of the surface conduction mold electron emission component 104, and have the external terminal Dx1 Dxm and Dy1 thru/or Dyn, respectively.
[0094] The envelope 118 consists of a face plate 116, a housing 112, and a rear plate 111 like ****. However, when it is prepared in order to mainly reinforce the reinforcement of a substrate 1, and it has sufficient reinforcement by substrate 1 the very thing, the rear plate 111 of the rear plate 111 of another object is unnecessary, seals the direct housing 112 in a substrate 1, and may constitute an envelope 118 from a face plate 116, a housing 112, and a substrate 1. Moreover, it can also consider as the envelope 118 which has sufficient reinforcement to atmospheric pressure by installing further the base material which is not illustrated [which is called a SU **-sir between a face plate 116 and the rear plate 111].
[0095] In the case of monochrome, it consists only of a fluorescent substance 122, but in the case of the fluorescent screen 114 of a color, a fluorescent screen 114 is constituted from the black **** material 121 and fluorescent substance 122 which are called a black stripe (drawing 10 (a)) or a black matrix (drawing 10 (b)) by the array of a fluorescent substance 122. The objects in which a black stripe and a black matrix are prepared are it not being conspicuous and carrying out color mixture etc. by distinguishing by different color between each fluorescent substance 122 in three primary colors which is needed in the case of color display with, and making the section black, and controlling lowering of the contrast by the outdoor daylight echo in a fluorescent screen 114. There is not only the ingredient that uses as a principal component the graphite usually well used as an ingredient of the black **** material 121 but conductivity, and other ingredients can also be used if transparency and echoes of light are few ingredients.
[0096] As an approach of applying a fluorescent substance 122 to a glass substrate 113, it is not based on monochrome and a color but a precipitation method and print processes are used.
[0097] Moreover, as shown in drawing 9 , the metal back 115 is usually formed in the inner surface side of a fluorescent screen 114. The metal back's 115 object is protection of the fluorescent substance 122 from the damage by the collision of the anion generated within acting as an electrode for impressing improving brightness and electron beam acceleration voltage and an envelope 118 etc. by carrying out specular reflection of the light by the side of an inner surface to a face plate 116 side among luminescence of a fluorescent substance 122 (refer to drawing 10). The metal back 115 performs data smoothing (usually called filming) of the inner surface side front face of a fluorescent screen 114 after production of a fluorescent screen 114, and it can produce by depositing aluminum with vacuum deposition etc. after that.
[0098] In order to raise the conductivity of a fluorescent screen 114 to a face plate 116 further, a transparent electrode (un-illustrating) may be prepared in the outside surface side of a fluorescent screen 114.
[0099] In case the above-mentioned sealing is performed, in order to have to make each color fluorescent substance 122 and the surface conduction mold electron emission component 104 correspond, in the case of a color, it is necessary to perform sufficient alignment.
[0100] The inside of an envelope 118 is closed, after exhausting through a non-illustrated exhaust pipe and reaching a predetermined degree of vacuum. Moreover, getter processing can also be performed in order to maintain the degree of vacuum after closure of an envelope 118. This is processing which heats the getter (un-illustrating) arranged to the position in an envelope 118, and forms the vacuum evaporationo film by resistance heating or high-frequency heating after closure, just before closing an envelope 118. Ba etc. is usually a principal component and a getter is for maintaining the degree of vacuum of torr by the absorption of this vacuum evaporationo film the 1x10 to 5th power, or

the 1x10 to 7th power. Here, the process after foaming processing of a surface conduction mold electron emission component can be set up suitably.
[0101] The above-mentioned display panel 201 can be driven in an actuation circuit as shown in drawing 11 . in addition, drawing 11 -- setting -- 201 -- a display panel and 202 -- for a shift register and 205, line memory and 206 are [a scanning circuit and 203 / a control circuit and 204 / a modulating-signal generator, and Vx and Va of a synchronizing signal separation circuit and 207] direct current voltage supplies.
[0102] As shown in drawing 11 , the display panel 201 is connected with the external electrical circuit through the external terminal Dx1 thru/or Dxm, the external terminal Dy1 or Dyn, and a secondary terminal Hv. Among this, the scan signal for carrying out one-line (every n elements) sequential actuation of the surface conduction mold electron emission elements by which matrix arrangement was carried out, and going is impressed to the letter of a matrix of the surface conduction mold electron emission component prepared in said display panel 201, i.e., a m line n train, at the external terminal Dx1 thru/or Dxm.
[0103] On the other hand, the modulating signal for controlling the output electron beam of each surface conduction mold electron emission component of one line chosen by said scan signal is impressed to a terminal Dy1 thru/or the external terminal Dyn. Moreover, the direct current voltage of 10kV is supplied to a secondary terminal Hv from direct current voltage supply Va. This is the acceleration voltage for giving sufficient energy exciting a fluorescent substance to the electron beam outputted from a surface conduction mold electron emission component.
[0104] A scanning circuit 202 equips the interior with m switching elements (the inside S1 of drawing 11 thru/or Sm show typically), and each switching elements S1-Sm choose the output voltage of the direct-current-voltage power source Vx, or either of 0V (grand level), and connect it to the external terminal Dx1 thru/or Dxm and an electric target of a display panel 201. Each switching elements S1-Sm can be easily constituted by combining the component which operates based on the control signal Tscan which a control circuit 203 outputs, and has a switching function like FET actually.
[0105] Said direct current voltage supply Vx in this example are set up so that a fixed electrical potential difference which the driver voltage impressed to the surface conduction mold electron emission component which is not scanned turns into below a threshold electrical potential difference may be outputted based on the property (threshold electrical potential difference) of said surface conduction mold electron emission component.
[0106] A control circuit 203 has the work which adjusts actuation of each part so that a suitable display may be performed based on the picture signal inputted from the exterior. Based on the synchronizing signal Tsync sent from the synchronizing signal separation circuit 206 explained below, each control signal of Tscan, Tsft, and Tmry is generated to each part.
[0107] The synchronizing signal separation circuit 206 can be easily constituted, if a frequency-separation (filter) circuit is used from the TV signal of the NTSC system inputted from the outside as it is a circuit for separating a synchronizing signal component and a luminance-signal component and is known well. As for the synchronizing signal separated by the synchronizing signal separation circuit 206, this also consists of a Vertical Synchronizing signal and a Horizontal Synchronizing signal so that may also be known well. Here, it illustrates as an expedient top Tsync of explanation. On the other hand, the luminance-signal component of the image separated from said TV signal is illustrated with a DATA signal for convenience. This DATA signal is inputted into a shift register 204.
[0108] A shift register 204 is for carrying out serial/parallel conversion of said DATA signal by which a serial input is carried out serially for every line of an image, and operates based on the control signal Tsft sent from said control circuit 203. You may put it in another way as this control signal Tsft being the shift clock of a shift register 204. Moreover, the data for the image of one line by which serial/parallel conversion was carried out (it is equivalent to the actuation data for n elements of a surface conduction mold electron emission component) are outputted from said shift register 204 as n parallel signals of Id1 thru/or Idn.
[0109] The line memory 205 is storage only for need time amount to memorize the data for the image of one line, and memorizes the content of Id1 thru/or Idn suitably according to the control signal Tmry sent from a control circuit 203. The memorized content is outputted as Id'1 thru/or Id'n, and is inputted into the modulating-signal generator 207.
[0110] The modulating-signal generator 207 is a source of a signal for carrying out the actuation modulation of each of a surface conduction mold electron emission component appropriately according to each of said image data Id'1 thru/or Id'n, and the output signal is impressed to the surface conduction mold electron emission component in a display panel 201 through a terminal Dy1 thru/or Dyn.
[0111] As mentioned above, the surface conduction mold electron emission component has the clear threshold electrical potential difference in electron emission, and only when the electrical potential difference exceeding a threshold electrical potential difference is impressed, electron emission produces it. Moreover, to the electrical potential

difference exceeding a threshold electrical potential difference, the emission current also changes and goes according to change of the applied voltage to a surface conduction mold electron emission component. Although the change degree of the emission current to the value and applied voltage of a threshold electrical potential difference may change by changing the ingredient of a surface conduction mold electron emission component, a configuration, and the manufacture approach, the following things can say anyway.

[0112] That is, when impressing a pulse-like electrical potential difference to a surface conduction mold electron emission component, for example, even if it impresses the electrical potential difference below a threshold electrical potential difference, electron emission is not produced, but in impressing the electrical potential difference exceeding a threshold electrical potential difference, it produces electron emission. It is possible in that case to control the reinforcement of the electron beam outputted by changing the peak value of an electrical-potential-difference pulse to the 1st. It is possible to control the total amount of the charge of the electron beam outputted to the 2nd by changing the width of face of an electrical-potential-difference pulse.

[0113] Therefore, as a method which modulates a surface conduction mold electron emission component according to an input signal, an electrical-potential-difference modulation technique and pulse width modulation are held. Although the electrical-potential-difference pulse of fixed die length is generated as a modulating-signal generator 207 when holding an electrical-potential-difference modulation technique, the circuit of the electrical-potential-difference modulation technique which can modulate the peak value of a pulse suitably according to the data inputted is used. Moreover, although the electrical-potential-difference pulse of fixed peak value is generated as a modulating-signal generator 207 when holding pulse width modulation, the circuit of the pulse width modulation which can modulate pulse width suitably according to the data inputted is used.

[0114] The thing or the thing of an analog signal type of a digital signal type is sufficient as a shift register 204 or the line memory 205, and serial/parallel conversion and storage of a picture signal just perform them at the rate of predetermined.

[0115] To use a digital signal type, it is necessary to digital-signal-ize the output signal DATA of the synchronizing signal separation circuit 206. This can be performed by forming an A/D converter in the output section of the synchronizing signal separation circuit 206.

[0116] Moreover, in relation to this, the circuits where the output signal of the line memory 205 is formed in the modulating-signal generator 207 by the digital signal or the analog signal differ a little.

[0117] Namely, what is necessary is just to add an amplifying circuit etc. to the modulating-signal generator 207 if needed using the D/A conversion circuit known well, for example with a digital signal in the case of an electrical-potential-difference modulation technique. Moreover, in the case of pulse width modulation, a digital signal can constitute the modulating-signal generator 207 from using the circuit which combined the comparator (comparator) which compares with the output value of said memory the output value of the counter (counter) which carries out counting of the wave number which a high-speed oscillator and an oscillator output, and a counter easily. Furthermore, the amplifier for amplifying the voltage of the modulating signal which a comparator outputs and by which Pulse Density Modulation was carried out even to the driver voltage of a surface conduction mold electron emission component if needed may be added.

[0118] On the other hand, in the case of an electrical-potential-difference modulation technique, a level shift circuit etc. may be added to the modulating-signal generator 207 if needed that what is necessary is just to use the amplifying circuit using the operational amplifier known well, for example with an analog signal. Moreover, the amplifier for amplifying the voltage even to the driver voltage of a surface conduction mold electron emission component if needed that what is necessary is just to use in the case of pulse width modulation (VCO) (for example, the voltage-controlled oscillator circuit known well) with an analog signal may be added.

[0119] The image formation equipment of this invention which has the above display panels 201 and an actuation circuit By impressing an electrical potential difference from Terminals Dx1-Dxm, and Dy1-Dyn Can make an electron emit from a required surface conduction mold electron emission component, and a secondary terminal Hv is led. The excitation and luminescence which impresses high tension to the metal back 115 or a transparent electrode (un-illustrating), accelerates an electron beam, and produces the accelerated electron beam by making it collide with a fluorescent screen 114 can perform a television display according to the TV signal of NTSC system.

[0120] In addition, the configuration explained above is suitably chosen so that it is an outline configuration required when obtaining the image formation equipment of this invention used for a display etc., for example, detailed parts, such as an ingredient of each part material, may not be restricted to the above-mentioned content and it may be suitable for the application of image formation equipment. Moreover, although NTSC system was held as an input signal, the image formation equipment concerning this invention may not be restricted to this, other methods, such as PAL and an

SECAM system, are sufficient as it, and TV signal which consists of much scanning lines rather than these further, for example, the high definition TV method which makes MUSE the start, is sufficient as it.
[0121] Next, an example of the electron source of the above-mentioned ladder type arrangement and the image formation equipment of this invention using this is explained using drawing 12 and drawing 13 .
[0122] In drawing 12 , ten 1 is prepared with common wiring whose 304 a substrate and 104 connect a surface conduction mold electron emission component, and connects the surface conduction mold electron emission component 104, and has the external terminals D1-D10 respectively.
[0123] Two or more surface conduction mold electron emission components 104 are arranged on the substrate 1 at juxtaposition. This is called a component line. And multi-line arrangement is carried out and this component line constitutes the electron source.
[0124] It is possible to drive each component line independently by impressing proper driver voltage between the common wiring 304 (for example, common wiring 304 of the external terminals D1 and D2) of each component line. Namely, what is necessary is to impress the electrical potential difference exceeding a threshold electrical potential difference to a component line to make it emit an electron beam, and just to make it impress the electrical potential difference below a threshold electrical potential difference to a component line to make it emit an electron beam. Impression of such driver voltage can perform the common wiring 304 304 of the external terminal D2 which adjoins each other, respectively, D3 and D4, D5 and D6, and D7, D8 and D9 which adjoins each other, respectively, i.e., common wiring, also as the same wiring of one about the common wiring D2-D9 located in each component space.
[0125] Drawing 13 is drawing showing the structure of the display panel 301 equipped with the electron source of the above-mentioned ladder type arrangement which are other examples of the electron source of this invention.
[0126] An external terminal for opening for a grid electrode to pass 302 in drawing 13 , and for an electron pass 303, and D1-Dm to impress an electrical potential difference to each surface conduction mold electron emission component, and G1-Gn are the external terminals connected to the grid electrode 302. Moreover, the common wiring 304 of each component space is formed on the substrate 1 as the same wiring of one.
[0127] In addition, the big difference from the display panel 201 using the electron source of the passive-matrix arrangement which the same sign as drawing 9 shows the same member in drawing 13 , and is shown in drawing 9 is the point of having the grid electrode 302 between the substrate 1 and the face plate 116.
[0128] Between the substrate 1 and the face plate 116, the grid electrode 302 is formed as mentioned above. This grid electrode 302 can modulate the electron beam emitted from the surface conduction mold electron emission component 104, and in order to make the electrode of the shape of a stripe established by going direct with the component line of ladder type arrangement pass an electron beam, it is what formed the opening 303 circular one piece at a time corresponding to each surface conduction mold electron emission component 104.
[0129] Since much openings 303 are formed in the shape of a mesh so that the configuration or arrangement location of the grid electrode 302 may not necessarily be shown in drawing 13 , the grid electrode 302 may be formed a perimeter and near the surface conduction mold electron emission component 104.
[0130] The external terminals D1-Dm, and G1-Gn are connected to the non-illustrated actuation circuit. And by impressing the modulating signal for the image of one line to the train of the grid electrode 302 synchronizing with carrying out sequential actuation (scan) of the one every train of the component lines, and going, the exposure to the fluorescent screen 114 of each electron beam can be controlled, and it can display the image of one line at a time.
[0131] As mentioned above, even if the electron source of which this invention of passive-matrix arrangement and ladder type arrangement is used for the image formation equipment of this invention, it can be obtained, and image formation equipment suitable as indicating equipments, such as not only the indicating equipment of the television broadcasting mentioned above but a video conference system, a computer, etc., is obtained. Furthermore, it can use also as an aligner of the optical printer constituted from a photoconductor drum.
[0132]
[Example] Although a concrete example is given to below and this invention is explained to it in detail, this invention is not limited to these examples and also includes that by which the permutation and design change of each element within the limits by which the object of this invention is attained were made.
[0133] (Example 1) The configuration of the surface conduction mold electron emission component of this example is the same as that of what is shown in drawing 1 , and explains the manufacture approach below based on production process drawing of drawing 3 R> 3.
[0134] process-a -- using the fully washed blue plate glass substrate 1, the aluminum with a thickness of 10 nanometers deposition-back was performed with the vacuum deposition method, patterning was performed by the photolithography method, and the piezo electric crystal electrode 7 was formed. Furthermore, ZnO with a thickness of 30 nanometers

was made to deposit by the spatter, and the piezo electric crystal layer 8 was formed (drawing 3 (a)).
[0135] The sequential deposition of Ti with a thickness of 5 nanometers and the nickel with a thickness of 100 nanometers was carried out with Process -b, next the vacuum deposition method, patterning was performed by the photolithography method, and the component electrodes 4 and 5 whose component electrode spacings L are 3 micrometers and whose width of face W2 is 300 micrometers were formed. Furthermore, revolution spreading of the organic Pd complex (ccp4230 and product made from Okuno Pharmaceuticals) was carried out with the spinner, and after performing heating baking processing for 10 minutes at 300 degrees C and forming the conductive thin film 3, patterning was carried out to the configuration as shown in drawing 3 (b) by the photolithography method.
[0136] After having installed the substrate 1 which passed through the process-c above-mentioned process in the measurement assessment system of drawing 6 , exhausting with the vacuum pump and reaching the degree of vacuum of torr the 2x10 to 5th power, while impressing the electrical potential difference and performing energization processing (foaming processing) between the component electrode 4 and 5 from the power source 51 for impressing the component electrical potential difference Vf, the electrical potential difference was impressed to the piezo electric crystal electrode 7, and the electron emission section 2 was formed (drawing 3 (c)).
[0137] Specifically, foaming processing was performed on the conditions shown in a table 1 about seven components produced at the above-mentioned process.
[0138] Consequently, in any case, the electron emission section 2 was formed and calorific value at the time of foaming was able to be made very small compared with the foaming art only by the conventional component electrode 4 and energization of a between [five].
[0139]
[A table 1]

素子番号	圧電体電極7への電圧パルス			素子電極4，5間への通電処理の電圧パルス		
	パルス波高値	時　間	電流	パルス波高値	時　間	電流
1	100(V)	10msec	1nA	3(V)	100msec	10mA
2	100(V)	10msec	1nA	3(V)	50msec	10mA
3	150(V)	10msec	2nA	2(V)	100msec	5mA
4	150(V)	10msec	2nA	2(V)	50msec	5mA
5	150(V)	10msec	2nA	2(V)	10msec	5mA
6	150(V)	10msec	2nA	3(V)	10msec	10mA
7	150(V)	10msec	2nA	3(V)	5msec	10mA

[0140] (Example 2) The configuration of the surface conduction mold electron emission component of this example is the same as that of what is shown in drawing 2 , and explains the manufacture approach below based on production process drawing of drawing 4 R> 4.
[0141] process-a -- using the fully washed blue plate glass substrate 1, the Au with a thickness of 15 nanometers deposition-back was performed with the vacuum deposition method, patterning was performed by the photolithography method, and the piezo electric crystal electrode 7 and the component electrode 4 were formed. Furthermore, AlN with a thickness of 50 nanometers was made to deposit by the spatter, and the piezo electric crystal layer 8 was formed (drawing 4 (a)).
[0142] On Process -b, next the piezo electric crystal layer 8, the Au with a thickness of 10 nanometers deposition-back

was performed with the vacuum deposition method, patterning was performed by the photolithography method, and the component electrode 5 was formed. Furthermore, a part of piezo electric crystal layer 8 was etched by using the component electrode 5 as a mask (drawing 4 (b)).
[0143] Revolution spreading of Process -c, next the organic Pd complex (ccp4230 and product made from Okuno Pharmaceuticals) was carried out with the spinner, and after performing heating baking processing for 10 minutes at 300 degrees C and forming the conductive thin film 3, patterning was carried out to the configuration as shown in drawing 4 (c) by the photolithography method.
[0144] After having installed the substrate 1 which passed through the process-d above-mentioned process in the measurement assessment system of drawing 6 , exhausting with the vacuum pump and reaching the degree of vacuum of torr the 2x10 to 5th power, while impressing the electrical potential difference and performing energization processing (foaming processing) between the component electrode 4 and 5 from the power source 51 for impressing the component electrical potential difference Vf, the electrical potential difference was impressed to the piezo electric crystal electrode 7, and the electron emission section 2 was formed (drawing 4 (c)).
[0145] Also in this example, when foaming processing was performed on the same conditions as an example 1 to seven components, the result with it was obtained like the example 1. [small generation of heat and] [good]
[0146] (Example 3) The electron source of passive-matrix arrangement as shown in drawing 8 , and image formation equipment as shown in drawing 9 were produced using the electron emission component of an example 1.
[0147] Manufacture of an electron source can be performed by extending the manufacture approach of the electron emission component of an example 1, and the detail is omitted.
[0148] Next, the example from which two or more conductive film produced as mentioned above constituted image formation equipment using the substrate 1 (drawing 8) by which matrix wiring was carried out is concretely explained with reference to drawing 9 and drawing 10 .
[0149] First, after fixing the substrate 1 (drawing 8) with which matrix wiring of two or more conductive film was carried out as mentioned above on the rear plate 111, To 5mm upper part of a substrate 1, a face plate 116 (a fluorescent screen 114 and the metal back 115 are formed and constituted by the inner surface of a glass substrate 113) is arranged through a housing 112. A face plate 116, housing Frit glass was applied to the joint of 112 and the rear plate 111, and it sealed by calcinating at 400 degrees C in atmospheric air for 10 minutes. Moreover, frit glass also performed immobilization of the substrate 1 to the rear plate 111.
[0150] In the case of monochrome, it consisted only of a fluorescent substance 122, but in this example, the fluorescent substance 122 adopted the stripe configuration (drawing 10 (a)), and the fluorescent screen 114 formed the black stripe previously, applied each color fluorescent substance 122 to the gap section, and produced the fluorescent screen 114. The ingredient which uses as a principal component the graphite usually well used as an ingredient of a black stripe was used.
[0151] Slurry method was used as an approach of applying a fluorescent substance 122 to a glass substrate 113. Moreover, the metal back 115 was formed in the inner surface side of a fluorescent screen 114. The metal back 115 performed data smoothing (usually called filming) of the inner surface side front face of a fluorescent screen 114 after production of a fluorescent screen 114, and it produced by carrying out vacuum deposition of the aluminum after that.
[0152] Since the conductivity of a fluorescent screen 114 is further raised to a face plate 116, a transparent electrode (un-illustrating) may be prepared in the outside surface side of a fluorescent screen 114, but in this example, since conductivity sufficient in just the metal back 115 was acquired, it omitted.
[0153] When performing the above-mentioned sealing, in the case of the color, sufficient alignment was performed in order to have to make each color fluorescent substance 122 and the surface conduction mold electron emission component 104 correspond.
[0154] Foaming processing was performed by impressing an electrical potential difference to the piezo electric crystal attached to each component like point ** through the external terminal Dx1 Dxm and Dy1 thru/or Dyn between the component electrode 4 of the surface conduction mold electron emission component 104, and 5 in the ambient atmosphere in the envelope 118 completed as mentioned above after performing sufficient exhaust air through an exhaust pipe (not shown), respectively, and the electron emission section was formed in each component.
[0155] Then, in order to exhaust the ambient atmosphere in an envelope 118 to the degree of vacuum of torr extent the 10 to 6.5th power with a vacuum pump through an exhaust pipe (not shown), to weld by heating a non-illustrated exhaust pipe with a gas burner, to close an envelope 118 and to maintain the degree of vacuum after closure further, getter processing was performed by the high-frequency-heating method.
[0156] In the image formation equipment of this invention completed as mentioned above, the external terminal Dx1 Dxm and Dy1 thru/or Dyn are led. While carrying out electron emission by impressing a scan signal and a modulating

signal to the surface conduction mold electron emission component 104 from a signal generation means by which it does not illustrate, respectively Impressed the high voltage of several kV or more to the metal back 114 through the secondary terminal Hv, accelerated the electron beam, it was made to collide with a fluorescent screen 115, and the display of an image was obtained by making light excite and emit.

[0157] (Example 4) Drawing 14 is drawing showing an example of the image formation equipment of this invention constituted so that the image information with which the display panel which used the above-mentioned surface conduction mold electron emission component as an electron source is provided from the various sources of image information which make television broadcasting the start could be displayed.

[0158] 201 in drawing -- a display panel and 1001 -- the actuation circuit of a display panel, and 1002 -- a display controller and 1003 -- a multiplexer and 1004 -- a decoder and 1005 -- as for an image input interface circuitry, and 1012 and 1013, for an image generation circuit, 1008, and 1009 and 1010, an image memory interface circuitry and 1011 are [an input/output interface circuit and 1006 / CPU and 1007 / TV signal receive circuit and 1014] the input sections.

[0159] In addition, although this image formation equipment naturally reproduces voice to a display and coincidence of an image when receiving the signal containing both image information and speech information like a television signal, it omits explanation about a circuit, a loudspeaker, etc. about reception, separation, playback, processing, storage, etc. of the speech information which is not directly related to the description of this invention.

[0160] Hereafter, the function of each part is explained in accordance with the flow of a picture signal.

[0161] First, the TV signal receive circuit 1013 is a circuit for receiving TV signal transmitted using radio-transmission systems, such as an electric wave and space optical communication.

[0162] Especially the method of TV signal to receive may not be restricted and which methods, such as NTSC system, a PAL system, and an SECAM system, are sufficient as it. Moreover, the so-called high definition TV which makes the start TV signal which consists of these from much scanning lines further, for example, MUSE, is a suitable source of a signal to employ the advantage of said display panel suitable for large-area-izing or large pixel number-ization efficiently.

[0163] TV signal received by the TV signal receive circuit 1013 is outputted to a decoder 1004.

[0164] The TV signal receive circuit 1012 is a circuit for receiving TV signal transmitted using cable-transmission systems, such as a coaxial cable and an optical fiber. Like said TV signal receive circuit 1013, especially the method of TV signal to receive is not restricted and TV signal received in this circuit is also outputted to a decoder 1004.

[0165] The picture signal which the image input interface circuitry 1011 is a circuit for incorporating the picture signal supplied from picture input devices, such as a TV camera and an image reading scanner, and was incorporated is outputted to a decoder 1004.

[0166] The picture signal which the image memory interface circuitry 1010 is a circuit for incorporating the picture signal memorized by the video tape recorder (it omits Following VTR), and was incorporated is outputted to a decoder 1004.

[0167] The picture signal which the image memory interface circuitry 1009 is a circuit for incorporating the picture signal memorized by the videodisk, and was incorporated is outputted to a decoder 1004.

[0168] The static-image data which are a circuit for incorporating a picture signal and were incorporated are inputted into a decoder 1004 from the equipment with which the image memory interface circuitry 1008 has memorized static-image data like a still picture disk.

[0169] The input/output interface circuit 1005 is a circuit for connecting this display and output units, such as an external computer, a computer network, or a printer. Not to mention performing I/O of image data, or an alphabetic character and graphic form information, it is also possible to perform a control signal, I/O of numeric data, etc. between CPUs1006 and the exteriors with which this image formation equipment is equipped depending on the case.

[0170] the image data, and an alphabetic character and graphic form information that the image generation circuit 1007 is inputted from the outside through said input/output interface circuit 1005 -- or it is a circuit for generating the image data for a display based on the image data, and the alphabetic character and graphic form information which are outputted from CPU1006. The circuit required for generation of an image is included in the interior of this circuit by making into the start the rewritable memory for accumulating image data, and an alphabetic character and graphic form information, the read-only memory the image pattern corresponding to a character code is remembered to be, the processor for performing an image processing, etc.

[0171] Although the image data for a display generated by this circuit is outputted to a decoder 1004, it is also possible to output to an external computer network and an external printer through said input/output interface circuit 1005 depending on the case.

[0172] CPU1006 mainly does the activity in connection with the motion control of this display, generation of a display image, selection, or edit.
[0173] For example, a control signal is outputted to a multiplexer 1003, and the picture signal displayed on a display panel is chosen suitably, or is combined. the picture signal displayed in that case -- responding -- the display-panel controller 1002 -- receiving -- a control signal -- generating -- a screen-display frequency, a scan method (for example, is it an interlace or non-interlaced?), and a stroke -- actuation of displays, such as the number of the scanning lines of a field, is controlled suitably. Moreover, the direct output of image data, or an alphabetic character and graphic form information is carried out, or an external computer and memory are accessed through said input/output interface circuit 1005 to said image generation circuit 1007, and image data, and an alphabetic character and graphic form information are inputted.
[0174] In addition, CPU1006 may be concerned also with the activity of the objects other than this. For example, it may be directly concerned with the function which generates information or is processed like a personal computer or a word processor. Or as mentioned above, it may connect with an external computer network through the input/output interface circuit 1005, for example, the activity of numerical calculation etc. may be done in cooperation with an external instrument.
[0175] The input section 1014 is for a user to input an instruction, a program or data, etc. into said CPU1006, for example, can use various input devices, such as a keyboard, a joy stick besides a mouse, a bar code reader, and a voice recognition unit.
[0176] A decoder 1004 is a circuit for transforming inversely the various picture signals inputted from said 1007 thru/or 1013 to a three-primary-colors signal or a luminance signal and an I signal, and a Q signal. In addition, all over drawing, as a dotted line shows, as for a decoder 1004, it is desirable to equip the interior with an image memory. This is for treating a TV signal which faces transforming inversely by making MUSE into the start, and needs an image memory.
[0177] By having an image memory, the display of a still picture becomes easy. Or the advantage that the image processing and edit which make the start infanticide of an image, interpolation, amplification, cutback, and composition become easy in cooperation with said image generation circuit 1007 and CPU1006 is acquired.
[0178] A multiplexer 1003 chooses a display image suitably based on the control signal inputted from said CPU1006. Namely, a multiplexer 1003 chooses [from] a desired picture signal among the picture signals which are inputted from a decoder 1004 and which were transformed inversely, and outputs it to the actuation circuit 1001. In that case, it is also possible by switching and choosing a picture signal within 1 screen-display time amount to display the image which divides one screen into two or more fields, and changes with fields like the so-called multi-screen television.
[0179] The display-panel controller 1002 is a circuit for controlling actuation of the actuation circuit 1001 based on the control signal inputted from said CPU1006.
[0180] As a thing in connection with fundamental actuation of a display panel, the signal for controlling the operating sequence of the power source for actuation of a display panel (not shown) is outputted to the actuation circuit 1001. As a thing in connection with the actuation approach of a display panel, the signal for controlling for example, a screen-display frequency and a scan method (for example, is it an interlace or non-interlaced?) is outputted to the actuation circuit 1001. Moreover, depending on the case, the control signal in connection with adjustment of the brightness and contrast of a display image, a color tone, or the image quality of sharpness may be outputted to the actuation circuit 1001.
[0181] The actuation circuit 1001 is a circuit for generating the driving signal impressed to a display panel 201, and operates based on the picture signal inputted from said multiplexer 1003, and the control signal inputted from said display-panel controller 1002.
[0182] As mentioned above, although the function of each part was explained, it is possible to display the image information inputted from the various sources of image information in this image formation equipment by the configuration illustrated to drawing 14 on a display panel 201. That is, after ******** of various kinds of picture signals which make television broadcasting the start is carried out at a decoder 1004, they are suitably chosen in a multiplexer 1003 and are inputted into the actuation circuit 1001. On the other hand, a display controller 1002 generates the control signal for controlling actuation of the actuation circuit 1001 according to the picture signal to display. The actuation circuit 1001 impresses a driving signal to a display panel 201 based on the above-mentioned picture signal and a control signal. Thereby, an image is displayed in a display panel 201. These the actuation of a series of is controlled by CPU1006 in generalization.
[0183] In this image-formation equipment, it is possible also in carrying out the image edit which carries out as the start in the image processing which it not only displays the image memory built in said decoder 1004, and the thing chosen

from the image generation circuit 1007 and information, but makes the start amplification, a cutback, a revolution, migration, edge enhancement, infanticide, interpolation, color conversion, aspect ratio conversion of an image, etc. as opposed to the image information to display, composition, elimination, connection, exchange, insertion, etc. Moreover, although especially explanation of this example did not describe, the specialized circuit for performing processing and edit also about speech information may be prepared like the above-mentioned image processing or image edit.
[0184] Therefore, this image formation equipment can have functions, such as an image edit device treating the display device of television broadcasting, the terminal equipment of a television conference, a static image, and a dynamic image, a terminal equipment of a computer, a terminal equipment for clerical work that makes a word processor the start, and a game machine, by one set, and its application range is very wide as industrial use or a noncommercial use.
[0185] In addition, it cannot be overemphasized that it is not the thing which does not pass over drawing 14 for an example of the configuration in the case of considering as the image formation equipment using the display panel which makes a surface conduction mold electron emission component the source of an electron beam to have been shown and by which the image formation equipment of this invention is limited only to this.
[0186] For example, even if it excludes the circuit in connection with the function which does not have the purpose-of-use top need among the components of drawing 14 , it does not interfere. Moreover, with this, if based on reverse in activity eye, a component may be added further. For example, when applying this indicating equipment as a TV phone machine, it is suitable to add the transceiver circuit containing a television camera, a voice microphone, a lighting machine, and a modem etc. to a component.
[0187] In this image formation equipment, since the surface conduction mold electron emission component is especially made into the electron source, the formation of a thin form of a display panel is easy, and can make depth of image formation equipment small. Big-screen-izing is easy for the display panel which makes a surface conduction mold electron emission component the source of an electron beam in addition to it, and since brightness is highly excellent also in an angle-of-visibility property, image formation equipment can display the image which was rich in overflow and force with sufficient visibility on presence.
[0188]
[Effect of the Invention] As explained above, according to this invention, attach a piezo electric crystal to the conductive film used as the film for electron emission of an electron emission component, the conductive film is made to generate a mechanical distortion using the inverse piezolectric effect produced by impressing an electrical potential difference to this piezo electric crystal, and the electron emission section is formed in the conductive film using this distortion. Moreover, mechanical generating of the conductive film by the above-mentioned inverse piezolectric effect of distortion promotes the local destruction, deformation, or deterioration of the conductive film at the time of the conventional foaming processing. Therefore, compared with the conventional foaming art, the calorific value at the time of energization processing is reduced substantially, and while being able to reduce substantially the effect on the component configuration member and the electron emission characteristic by this generation of heat, the power consumption in electron emission section formation and the processing time can be reduced substantially.
[0189] Moreover, since the magnitude of distortion generated on the above-mentioned conductive film is controllable by the electrical potential difference impressed to the piezo electric crystal ingredient to be used or a piezo electric crystal suitably, it is possible also for controlling the configuration of the electron emission section to some extent, and can arrange many electron emission components to which the property was equal by this.
[0190] the variation in the above thing to brightness -- being small -- rather than -- a reliable electron source and image formation equipment -- it can obtain .

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the top view and drawing of longitudinal section having shown typically an example of the surface conduction mold electron emission component which is an example of the electron emission component of this invention.
[Drawing 2] It is drawing of longitudinal section having shown typically other examples of the surface conduction mold electron emission component which is an example of the electron emission component of this invention.
[Drawing 3] It is drawing for explaining the manufacture approach of the surface conduction mold electron emission component of drawing 1 .
[Drawing 4] It is drawing for explaining the manufacture approach of the surface conduction mold electron emission component of drawing 2 .
[Drawing 5] It is drawing showing the example of a foaming wave.
[Drawing 6] It is the rough block diagram showing an example of the measurement assessment system of the surface conduction mold electron emission component of this invention.
[Drawing 7] It is drawing showing the emission current-component voltage characteristic (I-V property) of the surface conduction mold electron emission component of this invention.
[Drawing 8] It is the rough block diagram of the electron source of this invention of passive-matrix arrangement.
[Drawing 9] It is the rough block diagram of the display panel used for the image formation equipment of this invention using the electron source of passive-matrix arrangement.
[Drawing 10] It is drawing showing the fluorescent screen in the display panel of drawing 9 .
[Drawing 11] It is drawing showing an example of an actuation circuit which drives the display panel of drawing 9 .
[Drawing 12] It is the rough top view of the electron source of this invention of ladder type arrangement.
[Drawing 13] It is the rough block diagram of the display panel used for the image formation equipment of this invention using the electron source of ladder type arrangement.
[Drawing 14] It is the block diagram showing the image formation equipment concerning the example of this invention.
[Description of Notations]
1 Substrate
2 Electron Emission Section
3 Conductive Film
4 Five Component electrode
6 Piezo Electric Crystal
7 Piezo Electric Crystal Electrode
8 Piezo Electric Crystal Layer
50 Ammeter for Measuring Component Current If
51 Power Source
52 Ammeter for Measuring Emission Current Ie
53 High Voltage Power Supply
54 Anode Electrode
55 Vacuum Devices
56 Exhaust Air Pump
102 The Direction Wiring of X
103 The Direction Wiring of Y

104 Surface Conduction Mold Electron Emission Component
105 Connection
111 Rear Plate
112 Housing
113 Glass Substrate
114 Fluorescent Screen
115 Metal Back
116 Face Plate
118 Envelope
121 Black **** Material
122 Fluorescent Substance
201 Display Panel
202 Scanning Circuit
203 Control Circuit
204 Shift Register
205 Line Memory
206 Synchronizing Signal Separation Circuit
207 Modulating-Signal Generator
301 Display Panel
302 Grid Electrode
303 Opening
304 Common Wiring
1001 Actuation Circuit
1002 Display Controller
1003 Multiplexer
1004 Decoder
1005 Input/output Interface Circuit
1006 CPU
1007 Image Generation Circuit
1008 Image Memory Interface Circuitry
1009 Image Memory Interface Circuitry
1010 Image Memory Interface Circuitry
1011 Image Input Interface Circuitry
1012 TV Signal Receive Circuit
1013 TV Signal Receive Circuit
1014 Input Section

[Translation done.]

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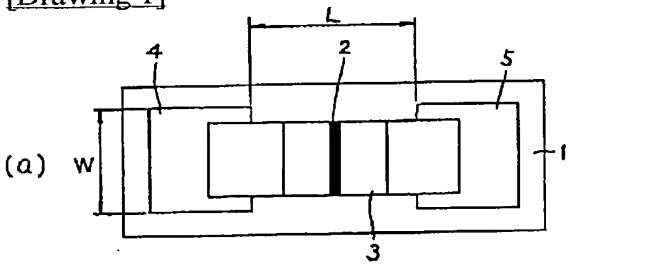
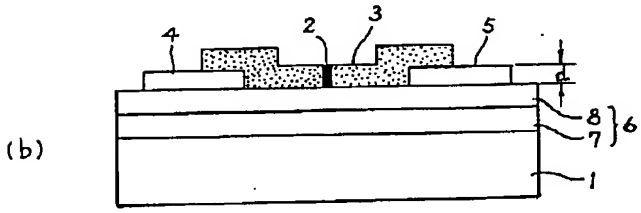
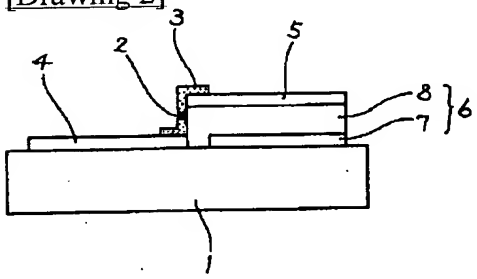
DRAWINGS

[Drawing 1]



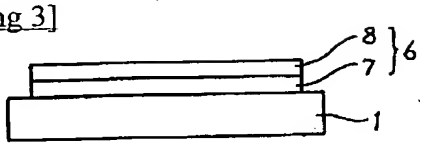


[Drawing 2]

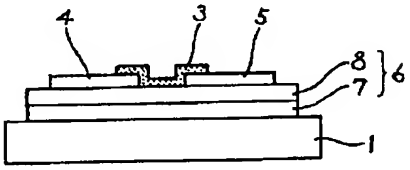


[Drawing 3]

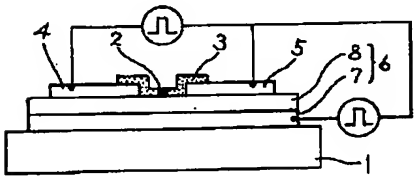
(a)



(b)

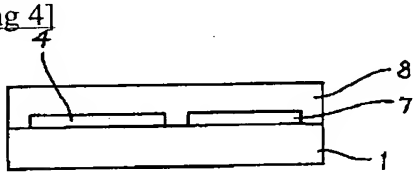


(c)

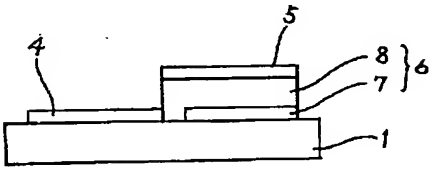


[Drawing 4]

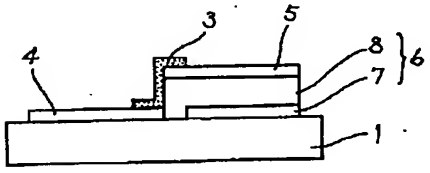
(a)



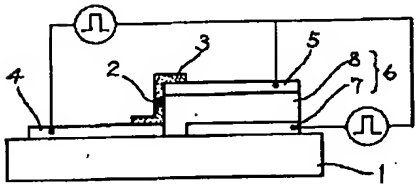
(b)



(c)

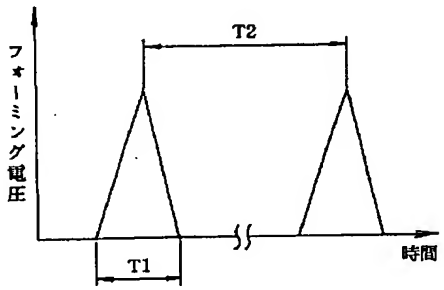


(d)

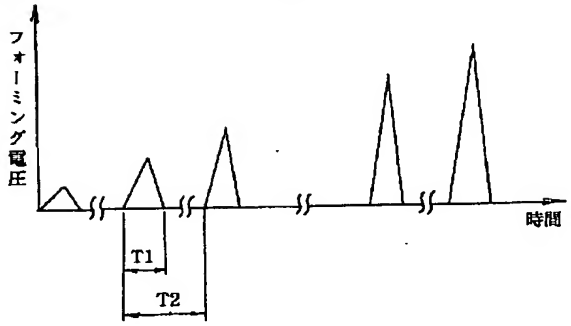


[Drawing 5]

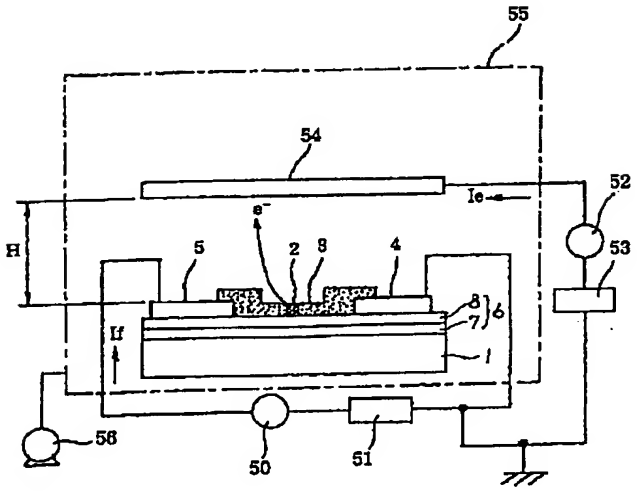
(a)


T2
フォーミング電圧
T1
時間

(b)


フォーミング電圧
時間
T1
T2

[Drawing 6]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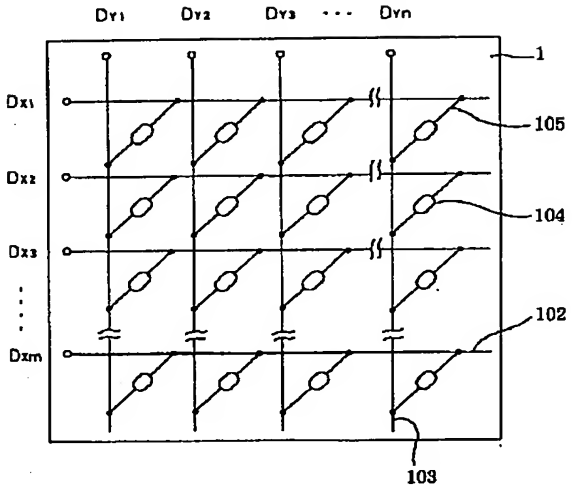
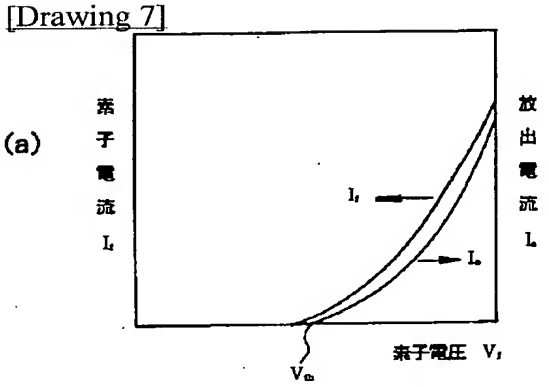
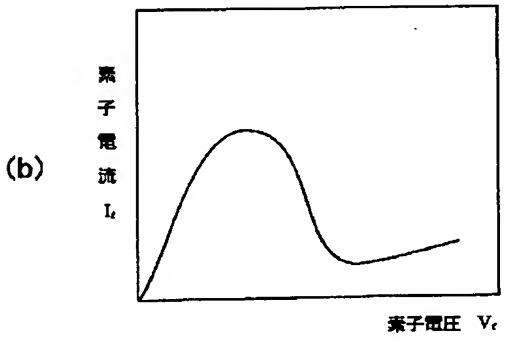
[Drawing 8]

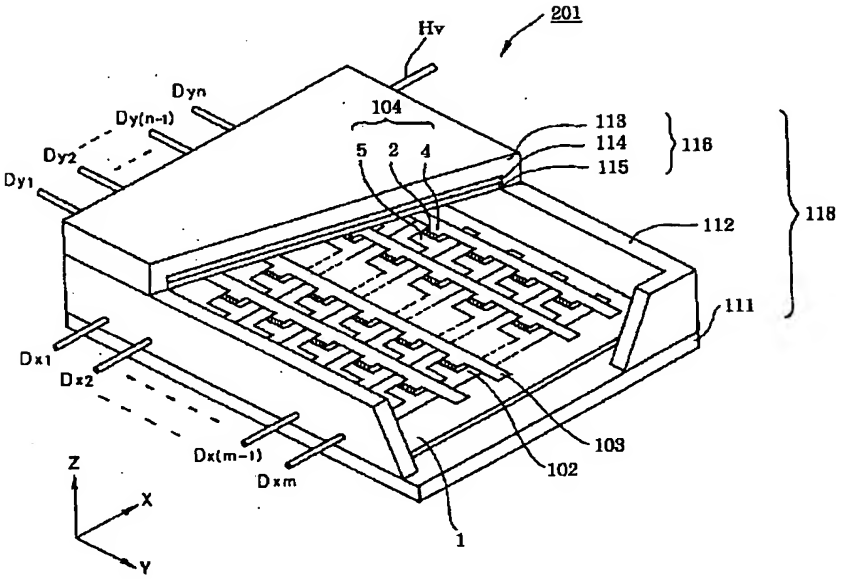


[Drawing 7]

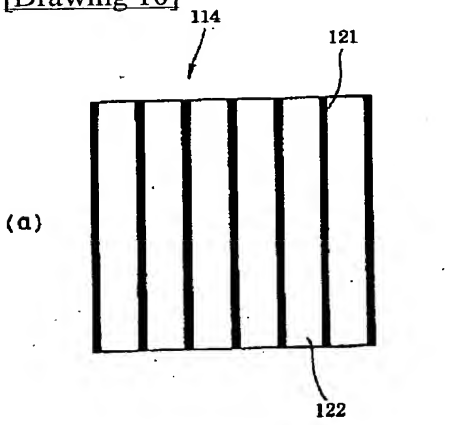


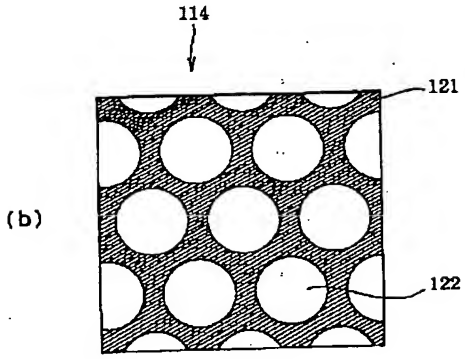


[Drawing 9]

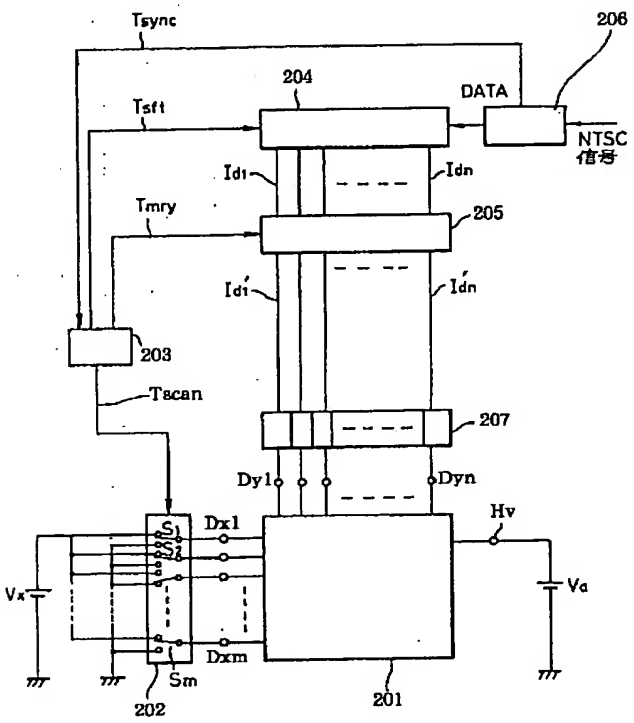


[Drawing 10]

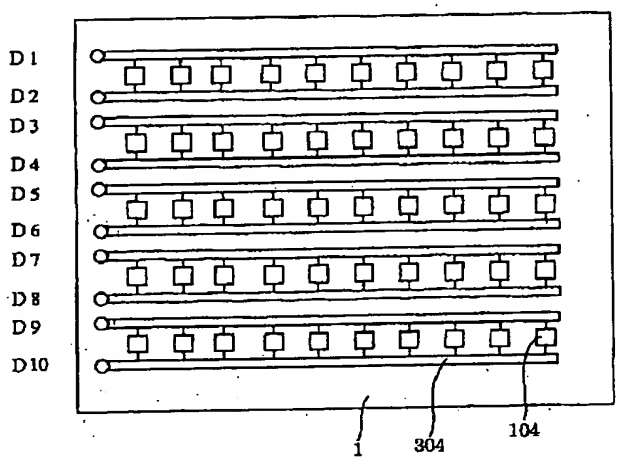




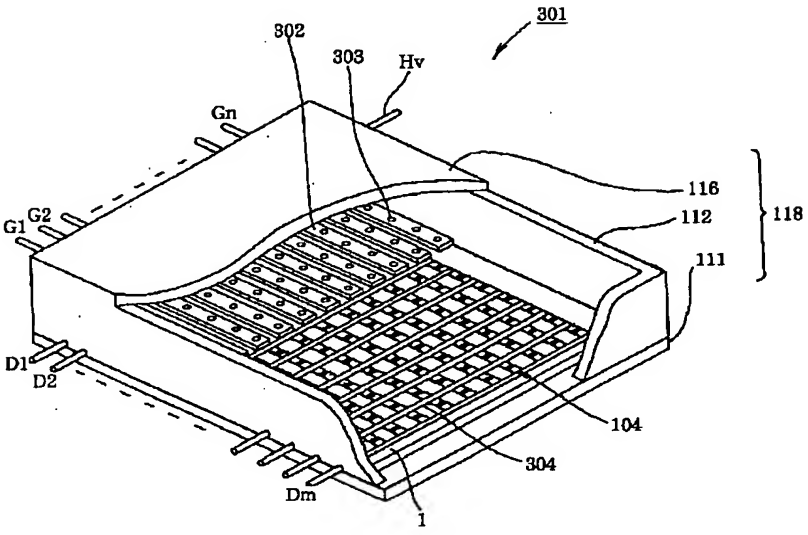
[Drawing 11]



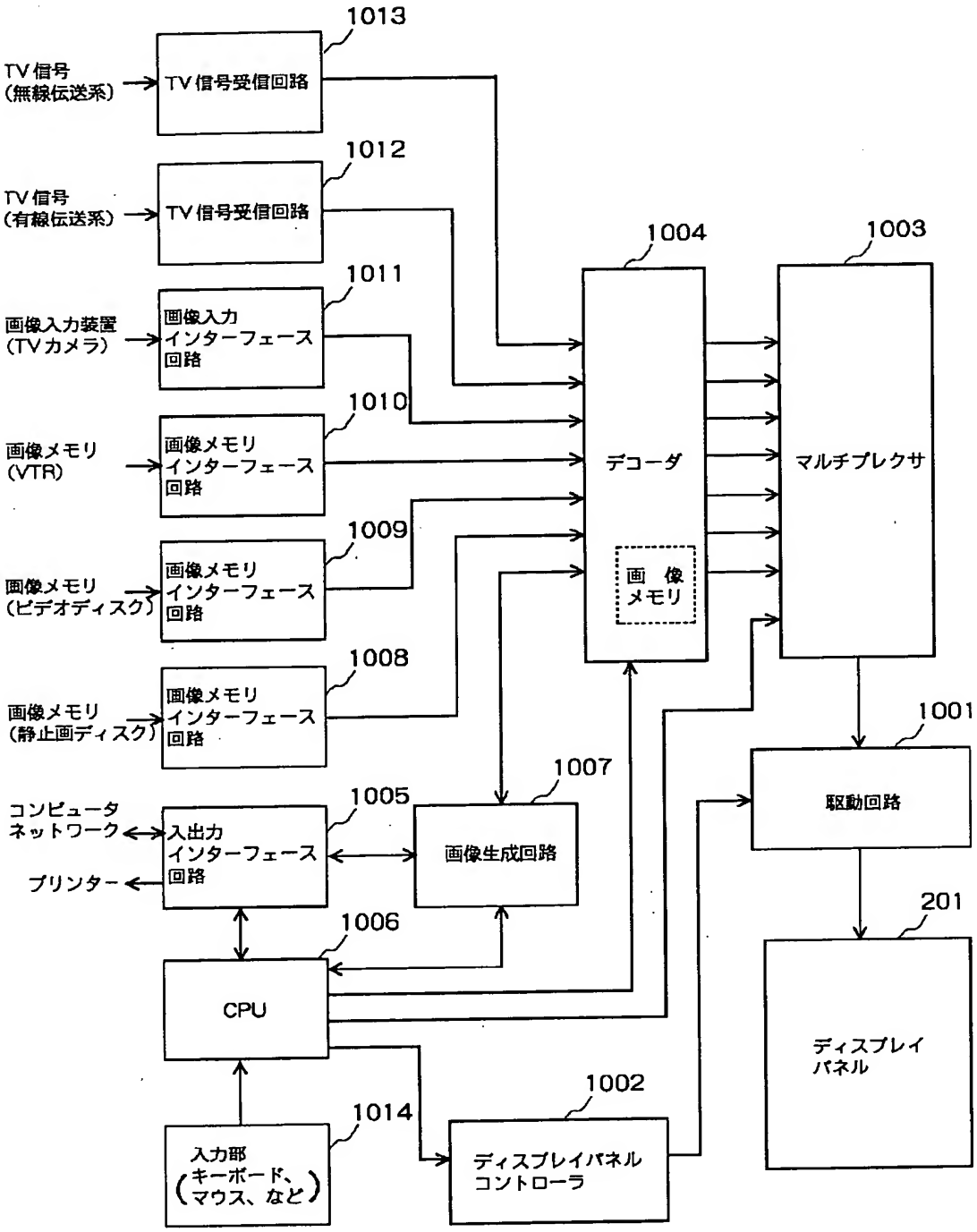
[Drawing 12]



[Drawing 13]



[Drawing 14]



[Translation done.]